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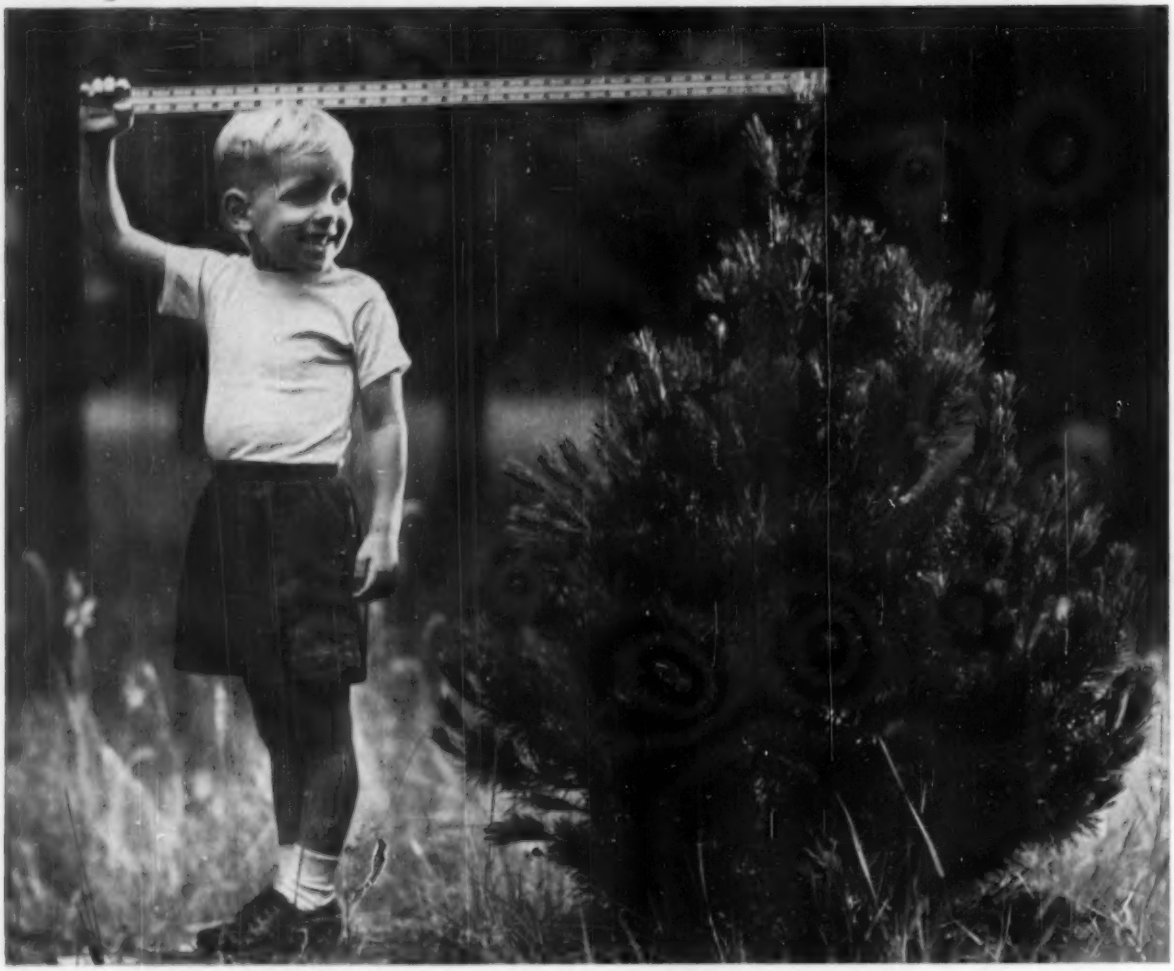

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Supply, Demand, and the Lumber Market

John A. Zivnuska
School of Forestry, University of California, Berkeley

An analysis of lumber production and price experience since World War I is presented as the basis for developing a working hypothesis of supply and demand trends. This hypothesis indicates that a long term decline in lumber supply, rather than declining demand, has been a major determinant of past lumber market behavior, and that supply problems are critical for future levels of market activity.

THE DOMINANT ROLE of the lumber industry in furnishing a market for the products cut from forest land is well known. Saw logs used for lumber manufacture are at least equal in volume and value to wood used for all other forest products combined. Thus present and potential levels of activity in the lumber market are questions of as direct interest to forestry enterprises as to enterprises in the manufacture and distribution of lumber. Analyses of the lumber market are both frequent and continuing.

Typically these analyses emphasize demand aspects of the market. For example, the forceful report of the Frampton Committee, "Let's face it . . . . The More People We Have . . . . The Less Lumber They Use,"[1] develops the market problems of the lumber industry solely in terms of the need for a survey of demand, research to develop new uses to increase demand, and improved merchandising. Similarly, the requirements analyses of the U. S. Forest Service have attempted to estimate only the future level of demand for lumber at a particular price relationship—"the quantity . . . . that might be used by consumers afforded reasonable latitude in choice of readily available materials. . . ."[2]

The purpose of this article is to emphasize that the level of activity in the lumber market is a function not only of the demand for lumber but also of the supply of lumber. From an analysis of lumber production and prices a hypothesis of lumber supply and demand is developed. This hypothesis indicates that problems of lumber supply are a major determinant of the present and future levels of activity in the lumber market. The interrelationships between lumber supply and forest management are also considered.

Some Economic Concepts

In an analysis of lumber supply and demand the concepts of price theory provide a helpful means of simplifying complex relationships. While these concepts are undoubtedly familiar, it is believed that a brief review of the principles of supply and demand will reduce misunderstanding and facilitate the argument.

"Demand" is used here in the sense of market demand — the schedule representing the quantities of a commodity which would be taken by all buyers at various alternative price levels, other conditions constant. Graphically, demand is represented by line *DD* in Figure 1. A "change in demand" refers to a shift of the entire schedule, not to a movement along the schedule. Thus an "increase in demand" means a shift of the demand curve upward and to the right to a position such as *D'D'*. Similarly, a "decline in demand" means a shift of the demand curve downward and to the left.

Correspondingly, "supply" refers to the schedule representing the quantities of a commodity which would be offered by all sellers at various alternative price levels, other conditions constant. Supply is represented by line *SS* in Figure 1. A "change in supply" also refers to a shift of the entire schedule, with a "decrease in supply" involving a shift of the supply curve upward and to the left to a position such as *S'S'*, while an "increase in supply" means a shift downward and to the right.

The intersection of the supply and demand schedules determines both the quantity, *Q*, and the price, *P*, at which consumption occurs. In this sense, statistical records of consumption show neither supply nor demand, but are at best simply a measure of the point of intersection of supply and demand. Over a period of time shifts in either or both supply and demand result in shifts of this point of intersection which are shown by changes in consumption. The problem for economic analysis of supply and demand based on historic records of consumption is to separate the sources of shifts in consumption into components of supply shifts and demand shifts.

A study of Figure 1 will demonstrate both the possibilities and limitations of interpreting consumption trends in terms of shifts

[1] The Products and Research Committee of the National Lumber Manufacturers Association. Let's face it. . . . The more people we have the more metal, the more plastics, and the less lumber they use. 1953.

[2] U. S. Forest Service. Potential requirements for timber products in the United States. Report 2 from a Reappraisal of the Forest Situation. 1946.

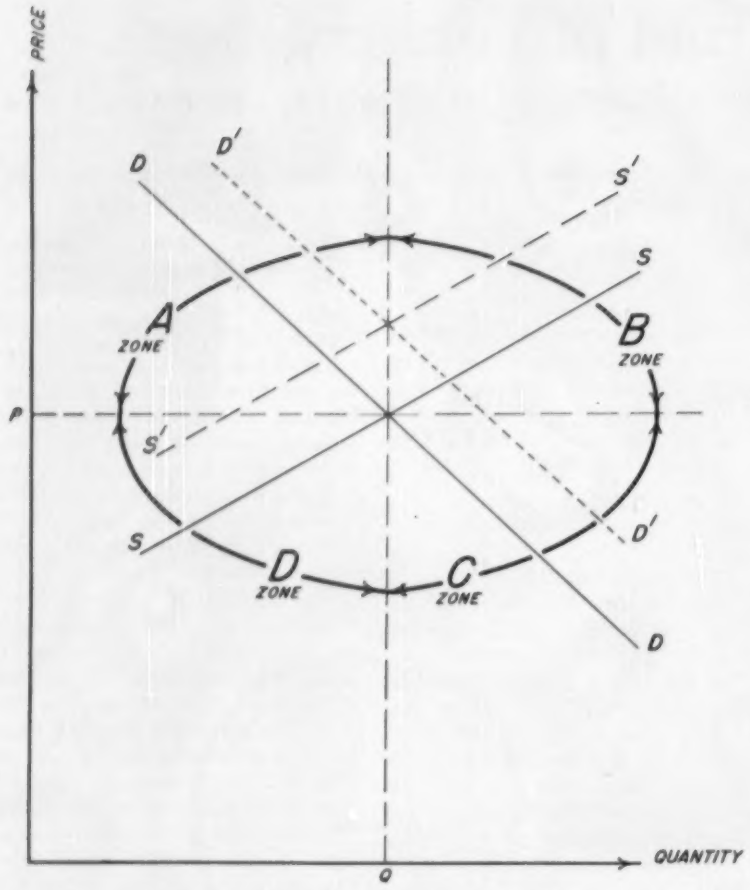

FIG. 1.—Model for supply and demand analysis.

of supply and demand. Consumption statistics for a particular period show the price-quantity dimensions (P and Q in Fig. 1) of the point of intersection of supply and demand, but give no information as to the position or shape of the remainder of the schedules SS and DD. Shifts in consumption over time will usually involve a shift of the point of intersection into one of the four zones, A, B, C, and D, indicated in the figure. The characteristics and possibilities of interpretation for movements in each of these directions are summarized below:

Zone A: Consumption decreases, price increases. A decline in supply is necessarily involved; demand may increase, decrease, or be stable.

Zone B: Consumption increases, price increases. An increase in demand is necessarily involved; supply may increase, decrease, or be stable.

Zone C: Consumption increases, price decreases. An increase in supply necessarily involved; demand may increase, decrease, or be stable.

Zone D: Consumption decreases, price decreases. A decline in demand is necessarily involved; supply may increase, decrease, or be stable.

If either the price or the quantity dimension remains constant while the other dimension shifts, it is of course possible to determine the direction of shift of both supply and demand. Such types of changes are essentially special cases and are indicated by the margins between the zones in Figure 1.

The final concept to be reviewed is that of elasticity. Qualitatively, the demand for a commodity is said to be "elastic" if a large relative change in the quantity demanded accompanies a small relative change in price and "inelastic" if the relative change in quantity accompanying the change in price is small. Correspondingly, supply is said to be "elastic" if a small relative price change results in a large relative change in the quantity supplied and "inelastic" if the relative change in quantity is small.

Analysis of National Lumber Production

To simplify the analysis, the problems of lumber imports and exports will not be considered here. The discussion will be set in terms of the supply of and market for domestically produced lumber. In addition, it will be assumed that apparent consumption of domestically produced lumber equals national lumber production, since adequate statistics on changes in lumber inventories are not available.

To use the concepts briefly discussed in the preceding section, it is necessary to have records of both price and quantity covering the period under study. The analysis here is based on the period from the end of World War I to the present. Prices are measured with an index of wholesale lumber prices expressed in constant dollars on a 1947-49 = 100 base. This index was derived from the Bureau of Labor Statistics index of wholesale lumber prices, which has been published on a base of 1947-49 = 100 from 1935 to the present. For this analysis the similar index on a base of 1926 = 100 was shifted to the 1947-49 = 100 base for period 1919 through 1934. As published the index reflects both changes in the general price level ("the purchasing power of the dollar") and changes in the wholesale price of lumber relative to prices generally. The effect of the changing price level was removed by deflating the published index of wholesale lumber prices by the Bureau of Labor Statistics index of all commodity prices.

Data on quantity of domestically produced lumber used in this analysis are based on estimated totals prepared by the Forest Service for the period 1919-1945; on Census reports for 1946, 1947, 1949, 1950, and 1951; and on the statistical summaries of the National Lumber Manufacturers Association

for 1948, 1952, and 1953. These data have been converted to a form similar to the price data by expressing the quantities relative to the average production of 1947 to 1949 taken as 100.

Trend analysis.—These indices of wholesale lumber prices in constant dollars and of lumber production are shown graphically on a semi-logarithmic scale in Figure 2. On this scale relative rates of change are shown directly by the slope of the lines, with equal slopes indicating equal relative rates of change regardless of the absolute levels of the indices. Study of this graph enables a variety of comparisons of the quantity and price aspects of lumber consumption trends and provides important indications of shifts in lumber supply and lumber demand during the last 35 years.

The decline in apparent consumption with a decline in price which occurred after the peak of the building boom in 1925 is a clear indication of a decline in lumber demand. This reached disastrous proportions in the early 1930's, after which the rises in both quantity and price show a period in which demand shifted upward.

On balance, the decade of the 1930's appears to have been marked by a decline in lumber supplies. This is brought out by a comparison of the period 1940-1942 with 1927-1929, which shows a decline in production from an average of 37.6 billion board feet annually to an average of 34.7 billion feet, while the index of wholesale lumber prices in constant dollars rose from an average of 49.4 to 69.1. While these data do not also enable an unequivocal statement about the net shift in demand during this period, it is clear that the pattern would require either an increase in demand, a highly inelastic demand, or a combination of the two.

During the later stages of World War II and the immediate postwar period both quantity and price were strongly influenced by various governmental controls, and the pattern during this period is not useful for the purposes of this analysis. However, the average annual apparent consumption of 38.2 billion board feet of domestically produced lumber for the period 1951-1953 shows a moderate increase over the 1940-1942 level, while the index of wholesale lumber prices in constant dollars rose from an average of 69.1 to an average of 108.0. This shows a substantial increase in the demand for lumber during the last decade—a conclusion which is not surprising in view of the great increase in construction and general economic activity which has occurred during this period. For this period the data do not give an equally definite indication concerning supply shifts, but this pattern would require either a decrease in supply, a highly inelastic supply, or a combination of the two.

Comparison of the last three years with the experience of 1923-1925 brings out the same conclusions as does general inspection of Figure 2. During the period 1951-1953 production has averaged 6 percent lower than the average level of 40.5 billion board feet during the 1923-1925 period, while the index of wholesale lumber prices in constant dollars has more than doubled from 52.8 to 108.0. Again, these data clearly indicate a decrease in supply. Evidence as to demand shifts is not equally clear, but there appears to be at least a strong presumption that demand has increased over this period. If the comparison is made with the experience of 1927-1929, the evidence concerning demand is definite. Production is very nearly identical in quantity in the two periods, while the index of wholesale lumber prices in constant dollars has recently been more than twice as high as in the late 1920's. Such a shift can only be explained by the combined effect of an in-

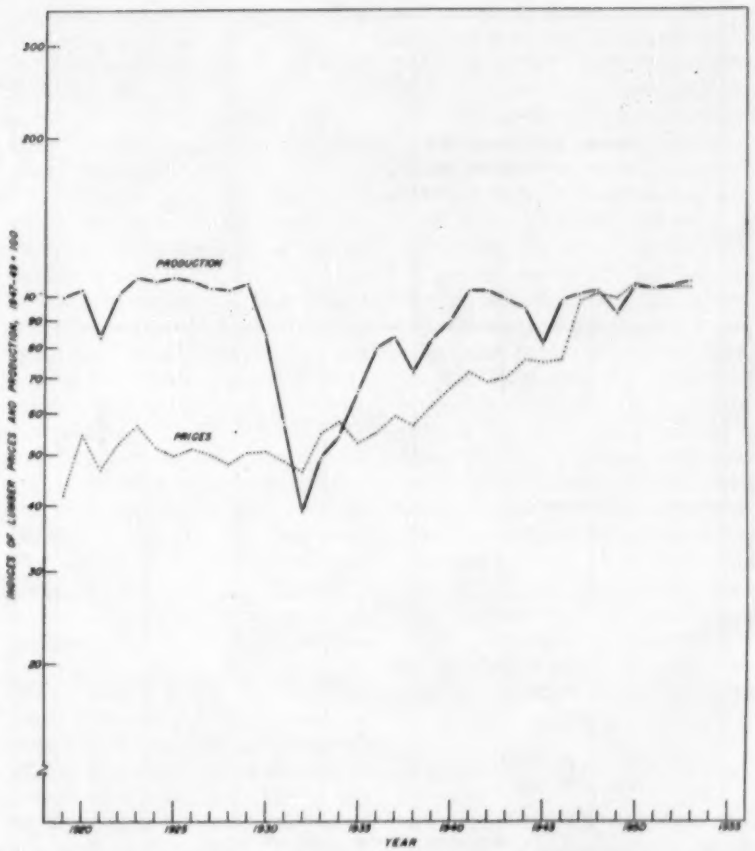

FIG. 2.—Indices of wholesale lumber prices in constant dollars and of lumber production. 1947-1949 = 100.

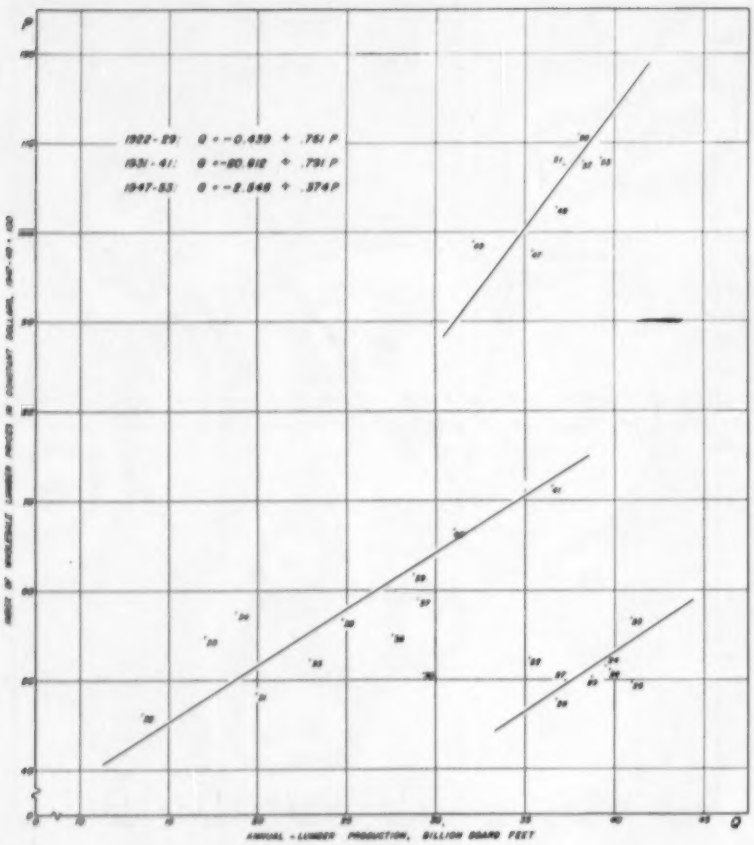

FIG. 3.—Relationship between lumber production and the index of wholesale lumber prices in constant dollars.

crease in demand with a decrease in supply.

Period analysis.—Similar conclusions result from analysis of the data in a somewhat different manner. Figure 3 is plotted using the index of wholesale lumber prices in constant dollars and the production of lumber in billions of board feet as coordinates, with the plotted price-quantity points representing the intersections of supply and demand for the designated years. In this figure the periods 1919-1921 and 1942-1946 are not included, the former being dropped due to the obscuring effects of the violent fluctuations of the economy which occurred following World War I and the latter due to the effects of the governmental control programs of World War II.

With the exception of 1930, the plotted points fall into three distinct groups which correspond directly to three different periods in the economy of the United States. The period 1922-1929 is the "plateau of prosperity" between the 1921 crash and the Great Depression. The period 1931 to 1941 includes the depths of the depression and the period of gradual recovery which merged into the high economic activity of World War II. Thus, 1930 might be considered as a sort of transition year between these two periods. Finally, the period 1947-1953 is the period of generally high economic activity which has existed since World War II.

To emphasize the pattern shown by these plotted intersections, straight lines were fitted to the data for each of these three periods. In fitting the lines, quantity was taken as the dependent variable and price as the independent variable. However, it should be noted that in Figure 3 price is plotted on the vertical axis in accordance with the conventional models of price theory rather than on the horizontal axis in accordance with statistical conventions.

In Figure 3, then, each of the three lines can be considered as indicating primarily the zone within which the intersection of supply and demand tended to move during a particular period in response to short term fluctuations. Correspondingly, the shifts between the lines emphasize the longer term trend in the level of the intersections of supply and demand. During the years under study here, this longer term trend has been upward and to the left, with a marked increase in the steepness of the line in the final period.

Such a pattern is a positive indication that lumber supply has decreased markely during this thirty year period. The pattern of quantity and prices shown in Figure 3 can be traced only with a supply schedule shifting upward and to the left over time.

Indications as to shifts in demand are not quite as clear as indications as to shifts in supply. However, the most probable explanation of the demand aspects of the pattern shown in Figure 3 is that demand is subject to pronounced cyclical shifts, but that the trend over the thirty year period has been for an increase in demand. Under the violent cyclical pattern of the Great Depression demand in the earlier part of the 1931-1941 period appears to have been lower than at any time in the 1922-1929 period, but in the latter part of the 1931-1941 period it is probable that demand was higher than during most of the 1920's. During the 1947-1953 period, it is probable that demand has fluctuated at a substantially higher level than it attained in any earlier period.

Regional Lumber Production

Even in a broad-brush analysis of national supply and demand shifts of the type presented here, it is helpful to consider at least briefly the regional patterns of changes in quantities produced in response to price changes. For detailed an-

alysis, it would be desirable to consider these regional patterns in terms of price relationships for the particular regions and species groups involved. However, for present purposes an attempt will be made simply to high-light production records against the background of shifts in wholesale lumber prices in constant dollars on a national basis discussed in the preceding section.

This can be approached by considering the trends shown by successive periods of high production. Data on production levels during selected periods of high production are summarized by regions in Table 1. As this table indicates, the quantity trends shown by total lumber production are also shown by softwood lumber and hardwood lumber considered separately.

Although reference has often been made to the ability of the South to maintain its level of production on a base of second-growth timber, it is evident from Table 1 that actually the trend in softwood lumber production in the South has been downward. Comparing the 1949-1951 production record, which is the most recent period for which regional estimates are available, with that of 1940-1942 shows that quantity was 20 percent lower while the index of wholesale lumber prices in constant dollars was 53 percent higher. Similar comparisons with 1927-1929 show production 28 percent lower and the price index 114 percent higher, and with 1923-1925 show production 68 percent lower with the price index 101 percent higher. Such a record is a clear indication of a substantial decline in softwood lumber supply in the South.

As Table 1 indicates, total lumber production in the South has been held up to some extent by an expansion of hardwood production. The level of hardwood lumber production in the South since World War II has been substantially higher than in any earlier period. Considering the changes in price which have occurred, this does not provide a basis for any conclusions as to whether the hardwood lumber supply schedule in the South has increased, decreased, or remained constant.

In the eastern states the evidence is clear that both softwood and hardwood lumber supply schedules have declined during the last thirty years.

Only in the West has there been an upward trend in softwood lumber production during the overall period of this study. As in the case of southern hardwoods, the upward trend in prices which accompanied this trend in production does not permit any direct conclusion as to shifts in the western softwood supply schedule. However, it may be noted that various sections within the West show divergent production patterns just as do the several regions within the United States. The nature of these sectional patterns is indicated by Table 2, which, like Table 1, is based on selected periods of high production.

As Table 2 shows, in Washington, which was the leading state in quantity of production during the 1920's, the present level of production is about one-half that of the 1920's, even though the index of wholesale lumber prices in constant dollars has doubled. Even in much of Oregon, now the leading lumber producer, there has been no expansion of output since the period immediately prior to World War II despite the great rise in prices. It is only the tremendous expansion of lumbering in southwestern Oregon and northern California which has enabled the Pacific Coast states to show a positive relationship between quantity of production and prices over the entire period of rising prices. In the West, excluding the Pacific Coast states, production has expanded somewhat as prices have risen, but for the 1949-51 period production in this section amounted to only 13 percent of total western production.

In brief, except for limited areas in the West and for hardwood lumber in the South, the long term pattern has been that movements along the lumber supply schedules involving increased output with higher prices have been more than offset by shifts of the supply schedules upward and to the left. The net effect over the period since World War I has been that in most lumber producing areas production has decreased while prices have increased—a certain sign of a decline in supply.

Hypothesis of Supply and Demand

An analysis of the type presented in the preceding sections obviously is subject to a number of limitations. To a considerable extent the reported quantity-price experience could be explained either by relatively large shifts of elastic schedules or by relatively small shifts of highly inelastic schedules.

TABLE 1.—DOMESTIC LUMBER PRODUCTION, SELECTED PERIODS

Period	Softwood lumber				Hardwood lumber			
	Total U. S.	12 Southern states	21 Eastern states	15 Western states	Total U. S.	12 Southern states	21 Eastern states	15 Western states
	Average annual production, billion board feet							
1923-25	32.7	15.3	2.8	14.6	7.8	3.4	4.3	0.1
1927-29	30.2	12.6	2.0	15.6	7.4	3.4	3.9	0.1
1940-42	28.3	11.4	2.1	14.8	6.3	2.7	3.5	0.1
1949-51	28.9	9.1	1.8	18.0	6.9	4.0	2.8	0.1

TABLE 2.—SOFTWOOD LUMBER PRODUCTION IN THE WEST, SELECTED PERIODS

Period	15 Western states	Washington	Oregon		California	Other 12 western states
			6 S. W. counties	35 Other counties		
	Average annual production, billion board feet					
1923-25	14.6	6.7	(3.9)		2.0	2.0
1927-29	15.6	7.3	0.9	3.5	2.0	1.9
1940-42	14.8	4.9	1.7	4.3	2.2	1.7
1949-51	18.0	3.5	3.9	4.0	4.3	2.3

Certainly from an essentially qualitative analysis it is not possible to measure the magnitude of the shifts in supply and demand which appear to have occurred. In addition, the inclusive types of statistical materials used are not suited for the detailed analysis of quantity-price experience by species and grades which would be needed for a complete study of the changing lumber market.

However, this analysis does enable the statement of a working hypothesis concerning the trends in lumber supply and demand which appears to be consistent with the economic history of the lumber industry. Such a working hypothesis may be helpful in analyses of the present situation of the lumber industry and of possible future markets. This hypothesis is stated in the following two paragraphs.

The lumber demand schedule is subject to great cyclical shifts, in the course of which it may drop to low levels. Over time, however, the trend in lumber demand is upward, with the post World War II period representing the highest level of demand yet reached. In addition to expanding (shifting upward and to the right), it is probable that the demand schedule is becoming more elastic.

The lumber supply schedule also fluctuates cyclically, with production showing an inelastic response to price in expansion at high levels of prosperity and a more elastic response in contraction. Over time the trend in lumber supply is downward, with the post World War II period representing the highest level of costs for the current ranges in volume which has been experienced. In addition to declining (shifting upward and to the left), it is probable that the supply schedule is becoming more inelastic.

Supply and Forests

Statement of the hypothesis that lumber supply is declining naturally gives rise to the question as to the reasons for this. Obviously, in an article such as this it is not possible to develop a complete answer to this question. Such an answer would involve the entire economics of production in the industry. It would include items such as the cost and productivity of labor, costs of and access to capital, adaptation of logging and milling technologies to raw material conditions, and the entire structure and organization of the industry in addition to an analysis of timber supply.

However, it can be shown that all these problems of labor, capital, technology, and organization are closely related to the changing forest conditions and timber supply in the United States. The supply problems of the industry originate in large part from its relation to its raw material base and the historic circumstances under which it has been shifting from an old-growth timber base to a young-growth timber base. Notable in this connection is the fact that the national expansion of production in response to rising prices which has been achieved since the 1940-1942 period has been brought about through great expansion in limited areas of virgin timber in which lumbering had not been conducted on a large scale previously. In practically all areas in which lumbering was well established during the 1920's the trend over thirty years has been for a decrease in output.

Although changing timber conditions appear to be the key to the complex of factors which explain the decline in the lumber supply schedule, it does not follow that efforts to increase the quantity of standing timber through voluntary or regulated forest management programs will automatically increase the lumber supply. Problems of labor costs, technology, and organization, whatever their root source, are among the immediately controlling elements in lumber supply. Changes in these elements can be made far more rapidly than changes in the quantity of standing timber.

Actually, the immediate effect of efforts to improve forest management is a decrease in the lumber supply schedule, while both the immediate and long-term effects are to make the supply schedule less elastic. During its initial phases forest management, by adding a demand for timber for growing stock to the demand for timber for products, makes timber less available than formerly, thus tending to decrease the supply of lumber and other products. It is only after the passage of the time involved in obtaining a physical production response in growing trees that more intensive management provides an expanded raw material base for increased product supply schedules. Inevitably, the supply of products from managed forests is less elastic than from unmanaged forests (in the short run), since the essence of forest management is control of the rate of cutting by physical criteria rather than by market criteria exclusively.

Thus, a primary argument for the view that the lumber supply schedule will not shift outward in the near future is the very rapid development of private forestry which is now occurring.

Demand and Markets

At first thought it may appear that the hypothesis that demand is increasing is inconsistent with the emphasis of many leaders within the lumber industry on the needs for increased demand-creating activities. Indeed, if demand is increasing while supply is decreasing some loss of lumber's participation in its traditional markets is inevitable due to supply conditions, and the weaknesses in marketing and trade promotion appear in part to be simply the mechanism through which this occurs rather than a fundamental cause.

However, for the individual producer in this market situation only a rising demand can hold price above his rising cost. Implicit in these conditions is a constant threat of a cost-price squeeze. While for the entire industry supply limitations may be a primary element in determining the level of consumption, for the individual producer demand is an ever-present and major problem.

Furthermore, the situation described here is one in which the demand for lumber has moved upwards under the buoying force of the tremendous expansion of economic activity in the United States —a force which has also resulted in increased demand for alternate materials. As the supply response in lumber has been more limited than in the case of many of the alternate materials, the effect of lumber supply trends has been to induce substitution and the development of new techniques. This in turn has limited the extent to which lumber demand has expanded and has increased the elasticity of that demand.

This combination of increasing price sensitivity in demand with rising costs in supply makes the lumber market extremely vulnerable to even a slight cyclical decline in demand. In this way the hypothesis presented here is consistent with the concern felt in the industry with demand. The hypothesis does, however, imply that the old maxim of a better product at a lower price may also be important to the industry in protecting and expanding its markets.

Site Index Curves for Lodgepole Pine in the Pumice Area of Central Oregon

Paul E. Lemmon, Roy A. Johnson and Orlo W. Krauter[1]

A SURVEY is being conducted in the pumice soils area of central Oregon to determine the relationships between forest and range sites, soils, and other environmental factors. This is commonly known as a site-soils correlation study. One very important element of this survey is the determination of the productive capacity of the land for the tree species and for forest and forage types when in excellent or near climax condition. Productive capacity for timber is obtained qualitatively by determining the site index. When properly referenced to a yield study, site index becomes a quantitative measure of productive capacity.

Lodgepole pine, (*Pinus contorta* var. *latifolia* Engelm.) (*4*), is one of the forest species involved in this study. Site index and yield tables have been developed from localized data in Montana by the U. S. Forest Service (*3*) and by the British Columbia Forest Service for their area (*1*). These do not appear to accurately reflect the growth conditions that exist in the pumice soils area of central Oregon (*5*).

This paper presents a growth curve, a site-index table, and site-index curves for lodgepole pine based on measurements made in natural, unmanaged stands in central Oregon. Since a simultaneous yield study was not possible some suggestions are given on a method of adjusting the U. S. and B. C. Forest Services' yield tables for use in central Oregon, based on the new site-index curves. Site-soils correlations are therefore made possible both on a qualitative and

TABLE 1.—SCOPE OF DATA

Site index	Data from: Forest plots — Total plots	Forest plots — Total tree-heights	Sectioned trees — Trees	Sectioned trees — Sectional tree-heights	Total height measurements
Class[1]			*Number*		
40	0	0	0	0	0
45	3	13	1	6	19
50	2	10	1	6	16
55	6	29	5	36	62
60	5	25	3	23	47
65	7	35	6	48	82
70	6	31	1	7	36
75	3	11	2	14	25
80	0	0	0	0	0
85	3	16	0	0	16
90	0	0	0	0	0
Total	35	170	19	140	303

[1]Entire site-index range was from 43 to 87. Classes are from 38 to 42, 43 to 47, 48 to 52, etc.

TABLE 2.—AVERAGE HEIGHT OF DOMINANT AND CODOMINANT LODGEPOLE PINE TREES IN CENTRAL OREGON BY 10-YEAR AGE CLASSES, SHOWING NUMBER OF MEASUREMENTS, STANDARD DEVIATION AND COEFFICIENT OF VARIABILITY

Age[1] class	Number of measurements	Tree height: Average	Tree height: Standard deviation	Tree height: Coefficient of variation
		Feet	*Feet*	*Percent*
20	19	12.4	6.10	49
30	23	18.5	7.78	42
40	15	27.3	9.08	33
50	29	36.5	10.03	27
60	37	47.7	9.52	20
70	44	54.7	9.21	17
80	60	61.3	12.53	20
90	41	63.1	12.07	19
100	20	71.2	13.01	18
110	12	67.4	9.78	15
120	—	—	—	—
130	3	74.3	8.75	12
Total	303			

[1]From 15 through 24, 25 thru 34, 35 thru 44, etc.

[1]Respectively woodland conservationists, Portland and Bend, Oregon, and woodland conservationists (West), Portland, Oregon, U. S. Soil Conservation Service.

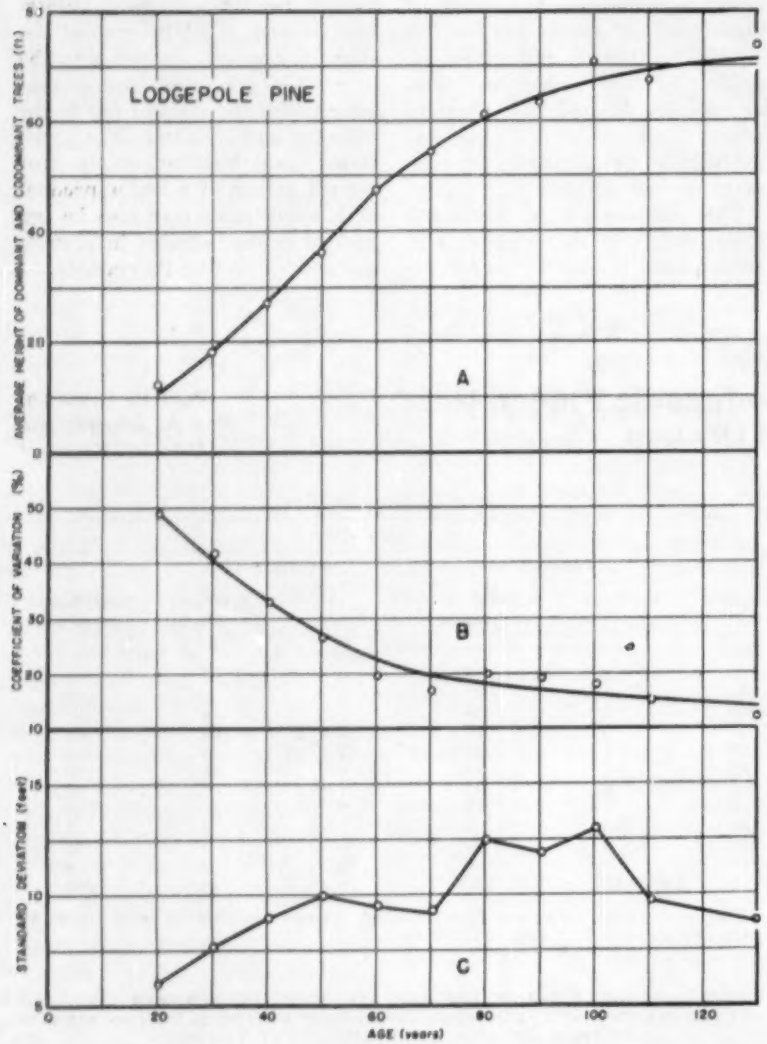

FIG. 1.—(A) Growth curve-average height of dominant and codominant lodgepole pine trees in central Oregon by 10-year age classes; (B) Relation of the coefficient of variation of the residuals to age; (C) Relation of the standard deviation of the residuals to age.

quantitative basis.

The data were obtained from 35 fully stocked, normal, and unmanaged forests sampling the pumice area of central Oregon. The average total height and total age of 5 dominant and/or codominant trees on each of these plots were determined by standard methods, using Abney hand level, tape, and increment borer. Age at breast height was corrected to total age.

Trees on 5 of the plots were felled and sectioned at 8-foot intervals, to obtain height-age relationships throughout their entire life. The age-height relationships at sectioned heights were consistent with that for trees of like age but where total height was determined. Consequently, each height and corresponding age was considered a measurement and handled individually for analysis, whether it came from a total tree-height determination or from sectioning. Scope of the data showing distribution of the measurements among site-index classes for total and sectional tree-height measurements is shown in Table 1. The distribution of the data among age classes is shown in Table 2, together with the average height in feet, the standard deviation and the coefficient of variation.

Information in Table 2 was plotted (Figure 1). Harmonized curves were drawn through the points for average heights and coefficients of variation. Site-index curves (Figure 2) and site-index Table 3 were then prepared, using the adjusted data from harmonized curves and

TABLE 3.—RELATIONSHIP BETWEEN AVERAGE TOTAL HEIGHT AND AGE OF DOMINANT AND CODOMINANT LODGEPOLE PINE TREES IN CENTRAL OREGON

Age	Average total height by site index								
	100	90	80	70	60	50	40	30	20
	Feet								
Years									
20	28	24	20	15	10	6	—	—	—
30	44	38	31	24	17	11	4	—	—
40	59	51	43	34	26	18	10	4	—
50	73	63	54	45	35	27	17	9	3
60	85	75	65	55	45	36	27	17	8
70	94	84	73	64	54	44	34	24	14
80	100	90	80	70	60	50	40	30	20
90	103	94	84	74	64	54	44	34	24
100	105	95	86	76	66	57	47	38	28
110	106	96	87	77	68	59	49	40	30
120	106	96	87	78	69	60	51	43	33
130	106	96	88	79	70	61	53	44	35

the proportional method corrected by the coefficient of variation described by Bruce and Schumacher (*2*). A site-index reference age of 80 years was used.

The site-index curves obtained were compared with those being used in the northern Rocky Mountains and in British Columbia. Significant variations in the shape of these sets of curves appeared to exist. This indicates differences in growth among the different geographical areas. A site-index age of 50 years was used by the U. S. Forest Service whereas 80 years was used in the other two cases. This accounts for variation in site-index levels applied to the different sets of curves but does not alter the growth trends reflected by them. The authors believe that the site-index curves presented will furnish an accurate basis for obtaining a qualitative evaluation of site potential for lodgepole pine in central Oregon.

For the lack of something better, one way of approximating quantitative yield information of lodgepole pine in central Oregon is to apply percentage adjustments to the U. S. Forest Service and the B. C. Forest Service yield tables. These adjusting factors represent the relationships between the total height (of dominant and codominant trees at different age and site-index classes) in central Oregon and that for trees in the northern Rocky Mountains and British Columbia.

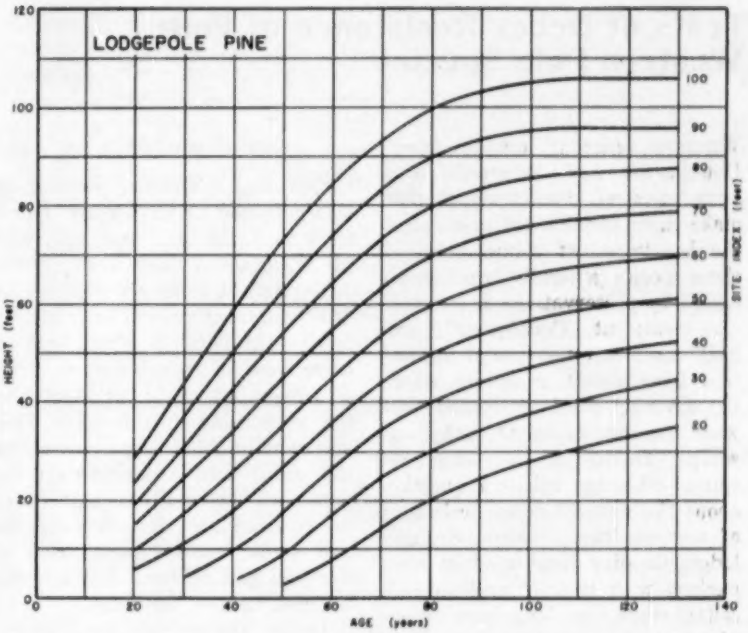

FIG. 2.—Relationship between average total height and average total age of dominant and codominant lodgepole pine trees in central Oregon by site-index classes. (Site reference age—80 years).

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Tests of Decay Resistance of Four Western Pole Species

George H. Englerth and Theodore C. Scheffer

Pathologists, Central States Forest Experiment Station and Forest Products Laboratory,[1] Forest Service, U. S. Department of Agriculture

WESTERN redcedar, western larch, Douglas-fir, and lodgepole pine have physical characteristics that make them suitable for poles. But the heartwood of round poles of these species generally is not penetrated by preservatives in commercial treatment. Consequently, the heartwood has no special protection from decay at points where the covering shell of treated sapwood becomes ruptured, as by seasoning checks or by climbers' spurs. This has raised a question about the natural decay resistance of western larch, Douglas-fir, and lodgepole pine heartwood in comparison with that of western redcedar, which has long been recognized as adequate for poles. Field and laboratory tests of decay resistance were therefore made to answer the question for pole-size trees in the Inland Empire[2].

[1]Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

Procedure

Sampling.—Material for testing was collected from freshly felled trees in Idaho and Montana, and in Washington just west of the Idaho line. A summary description of the sampled trees of each species is given in Table 1. From each of these trees an 18-inch bolt was taken from what would correspond to the groundline of the pole. This was usually about 4 to 6 feet above the stump cut, depending on the pole size. In addition, bolts were taken from six western redcedar and seven western larch trees at the top, and midway between the top and base of the trees.

In the laboratory, 1- by 1- by 18-inch sticks were sawed from the heartwood portion of the bolts. As permitted by bolt diameter, cedar and larch stakes were taken from three radial zones: outer heartwood, and inner heartwood, falling respectively within the outer, middle, and inner one-third of the heartwood radius. The Douglas-fir and pine bolts were sampled in the outer heartwood only, since on the basis of background information, important radial differences in decay resistance in these woods seemed unlikely. In all cases the same zone was sampled twice, on opposite sides of the bolt.

Some of the sticks from each zone were cut into 7-inch lengths, and these short stakes made up the sample material for the field tests. The remainder of the sticks were cut into blocks 3/8 inch long for the laboratory decay test.

Testing for decay resistance.—Three field tests were made. One test plot was near Gulfport, Miss., one near Missoula, Mont., and one at Madison, Wis. Usually four stakes from each sampled position

[2]Includes Montana west of the Continental Divide, Idaho north of the Salmon River, and eastern Washington.

TABLE 1.—DESCRIPTION OF SAMPLED TREES

Factor	Measure	Wood			
		Western redcedar	Western larch	Douglas-fir	Lodgepole pine
Number of trees sampled		15	18	6	10
Pole class[1]	Range	2-6	1-7	1-6	4-7
	Most frequent	4	4	6	6
Pole length (feet)	Range	18-60	15-60	40-50	30-55
	Average	47	43	45	42
D.b.h. (inches)	Range	6.7-18.2	7.0-19.0	10.0-18.2	9.4-14.3
	Average	12.5	13.1	12.7	11.4
Age at stump height (years)	Range	134	60-315	60-208	58-220
	Average	85-250	133	127	121
Crown class	Range	Intermediate-suppressed	Intermediate-dominant	Intermediate-dominant	Intermediate-dominant
	Most frequent	Suppressed	Dominant	Codominant	Codominant
Growing site	Range	Good-optimum	Medium-optimum	Poor-good	Good-optimum
	Most frequent	Optimum	Optimum	(Equal)	(Equal)
Specific gravity of outer heartwood[2]	Range	0.32-0.43	0.60-0.89	0.43-0.59	0.42-0.57
	Average	0.37	0.69	0.49	0.48
Rings per inch in outer heartwood	Range	12-38	12-71	8-40	8-55
	Average	23	34	23	27

[1]According to American Standard Specifications and Dimensions for Wood Poles, A.S.A. No. 05.1-1948.
[2]Based on weight and volume when oven dry.

in a tree were placed on each plot. The stakes were partially randomized for position on a plot and were set to a depth of 6 inches. They were left in test for 4 years.

The laboratory test was made by exposing the blocks to attack by pure cultures of six brown-rot fungi: *Fomes roseus* (Madison 701), *Lentinus lepideus* (Mad. 534), *Lenzites trabea* (Mad. 617), *Poria incrassata* (Mad. 563), *P. monticola* (Mad. 698, and *P. xantha* (Beltsville 94155). All of these fungi are prominent causes of decay in coniferous wood, and all but *P. xantha* have been extensively used in other tests.

The soil-block method of testing was used. Six-ounce French square bottles were half filled with moist, fertile top soil, and a 1- by 1- by ¼-inch feeder block of pine sapwood was laid on top of the soil. The bottles thus prepared were sterilized by autoclaving, cooled, and inoculated with one of the test fungi. Three weeks later, the test blocks were put in bottles, separately by species, and partially sterilized with steam at 212° F. for 20 minutes, and when cool were laid, one to a bottle, on top of the then overgrown feeder blocks. Lastly, the bottles were held for 3 months in a room maintained at 80° F. and 70 percent relative humidity.

Amounts of decay in both field stakes and laboratory test blocks were measured by the percentage loss in the dry weight of the wood. Before and after the test, the samples were dried to equilibrium weight in a room maintained at 80° F. and 30 percent relative humidity. Losses were measured from these equilibrium weights.

Results

Differences among tests.—Weight losses produced by decay in the different woods and under the different test conditions are summarized in Table 2.[3] Although differences occurred between tests in amount of decay, the relative order of decay resiistance exhibited by the different woods tended to be similar. Save in a small part of the test plot, decay of all woods at Missoula was slight, and significant differences among the woods were not brought out. Differences between the Madison and Gulfport tests in overall amounts of decay occurring in the larch, Douglas-fir, and pine stakes were small. In the case of the redcedar, however, much more decay occurred on the Gulfport than on the Madison plot.

The slight amount of decay at Missoula reflects the comparatively dry climate of the area. Deeper stakes, reaching moister soil, possibly would have undergone more decay. The Gulfport plot was expected to produce maximum amounts of decay because of its semitropical environment. Its failure to do this except in the redcedar is attributed to low fertility and restricted microorganism population of the soil on the plot, although the relation of decay rate to soil character is uncertain. The marked vulnerability of the redcedar at Gulfport, where decay otherwise was comparatively moderate, suggests a weakness of this species that is not shared by the others. Apparently a considerable portion of the extractives responsible for the redcedar decay resistance was leached out of the wood by the prevalently wet soil at Gulfport. In support of this explanation, decay of the redcedar stakes at Gulfport tended to be confined to the outer zones, whereas in the other tests the stakes were more uniformly affected when attacked.

Relative heartwood decay resistance of the different woods.—The foregoing indicates that environmental conditions also may influence the relative as well as the overall rates of decay in different woods. Consequently, the decay resistance of the different woods considered here must be appraised partially in the light of individual test conditions. To facilitate the comparisons, Figure 1 was prepared. This is a graphic portrayal of the averages shown in Table 2, omitting the Missoula results. For better practical perspective, results for the three different radial positions in the trunk are illustrated by bars of different width. The widths are proportional to the different trunk volumes represented by the outer, middle, and inner one-third of the heartwood (ratios of volumes are, respectively, 5: 3:1).

Within individual redcedar trees the decay resistance varied greatly according to a fairly well-defined pattern. Generally the outer heartwood was more resistant than the inner heartwood, and wood of the lower trunk was more resistant than that of the upper trunk. This pattern of resistance has been found in a number of other woods. Where pronounced, it should be considered in characterizing the decay resistance of a species. It may be seen from Figure 1 that there was a similar variation in resistance in the larch trees, although not of sufficient magnitude to be of practical importance. Slight radial trends but no vertical trends of decay resistance were found in an earlier study of second-growth Douglas-fir.[4] Neither radial nor vertical trends were apparent in supplementary tests of the lodgepole pine. It appears from these observations and earlier ones on other woods that within-tree variation in heartwood decay resistance is generally greatest in the most resistant species.

Keeping in mind this within-tree variation, the decay resistance of the four woods may now be compared. Western larch tended for

[3] Average losses shown in Table 2 for middle and inner heartwood deviate slightly in some cases from the observed values. All cedar and larch trees were tested at the outer heartwood, but only part of them at the middle and inner heartwood. Average weight losses for the middle and inner heartwood, therefore, were adjusted so as to maintain the same differences between them and the outer heartwood averages as were actually found in trees in which both were tested. Thus the listed averages are strictly as found for the outer heartwood and approximately what might be expected for the other positions had those positions been tested in all trees. No significant changes were affected by similar adjustments for comparing weight losses in wood from different elevations in the trunk; consequently, none were made.

[4] Scheffer, Theodore C., and George H. Englerth. Decay resistance of second-growth Douglas-fir. Jour. Forestry 50: 439-42. 1952.

TABLE 2.—RESULTS OF DECAY TESTS OF HEARTWOOD FROM DIFFERENT PARTS OF POLE-SIZE TREES OF WESTERN REDCEDAR, WESTERN LARCH, DOUGLAS-FIR, AND LODGEPOLE PINE

Wood species	Number of trees for Test				Heartwood zone	Weight loss in field tests (stake samples) and in the laboratory test (block samples)[1]							
						Test A		Test B		Test C		Test D	
						Gulfport plot		Missoula plot		Madison plot		In laboratory[2]	
	A	B	C	D		Range	Average[3]	Range	Average[3]	Range	Average[3]	Range	Average[3]
						Percent							
					LOWER TRUNK								
Cedar	14	15	15	15	Outer	7-52	19	2-8	3	4-26	13	4-26	11
Cedar	4	4	6	4	Middle	12-25	22	2-4	3	4-30	19	8-20	15
Cedar	5	6	6	6	Inner	16-34	26	2-11	5	5-20	16	11-26	19
Larch	17	18	18	18	Outer	12-19	14	2-13	6	8-36	18	21-32	27
Larch	3	3	3	4	Middle	14-18	17	4-14	7	7-28	23	26-32	28
Larch	6	6	6	6	Inner	13-20	16	3-7	5	11-26	23	24-35	29
Douglas-fir	6	6	6	6	Outer	12-22	18	2-8	4	14-17	15	30-37	33
Pine	9	10	10	10	Outer	12-29	20	1-9	3	12-37	26	34-43	38
					GENERAL TRUNK								
Cedar	6	6	6	6	Outer	15-34	25	3-10	6	10-19	14	11-26	17
Cedar	2	2	3	3	Middle	31-34	27	4-6	5	7-22	14	21-32	27
Cedar	3	6	6	6	Inner	23-26	19	2-15	6	8-29	19	17-33	27
Larch	6	6	6	6	Outer	11-17	14	3-9	6	12-27	19	26-32	29
Larch	3	3	3	4	Middle	16-18	16	3-14	5	18-21	19	31-34	32
Larch	4	6	6	6	Inner	14-20	16	1-20	6	11-26	17	26-39	32
					UPPER TRUNK								
Cedar	5	6	6	6	Outer	26-35	30	3-16	5	4-28	18	17-36	26
Larch	7	7	7	7	Outer	12-20	16	2-6	4	7-29	18	27-32	30
Larch	2	2	2	2	Middle	19-20	22	4-12	8	16-20	17	27-33	31
Larch	5	5	5	6	Inner	17-20	19	4-13	8	13-27	21	30-35	32

[1]Each field-test average is based on trials of usually 4 stakes per tree, and each laboratory-test average on 24 blocks per tree (4 for each test fungus).
[2]Listed results are averages for 6 test fungi.
[3]Average losses shown for middle and inner heartwood deviate slightly in some cases from the observed values. (See footnote 4, text).

the most part to be a little more resistant than Douglas-fir and Douglas-fir a little more resiistant than lodgepole pine. Western redcedar was both more and less resistant than the other woods, depending on the test and on the portion of the trunk sampled.

In the laboratory test, which provided little opportunity for leaching, western redcedar exhibited markedly superior decay resistance throughout most of the lower trunk and in the outer heartwood of the central trunk. Through the remainder of the trunk (upper trunk and middle and inner heartwood of the central trunk) it was just slightly more resistant than the larch. In the field test at Madison where leaching was conditioned by annual precipitation averaging about 30 inches and frozen top soil during winter months, the outer heartwood of the lower and central redcedar trunk was moderately more resistant than the larch and the remainder of the trunk was only slightly if at all more resistant. In the Gulfport test, where the annual rainfall averaged more than 60 inches, the resistance of western redcedar from all positions in the trunk was inferior to that of western larch, and mostly by a large margin.

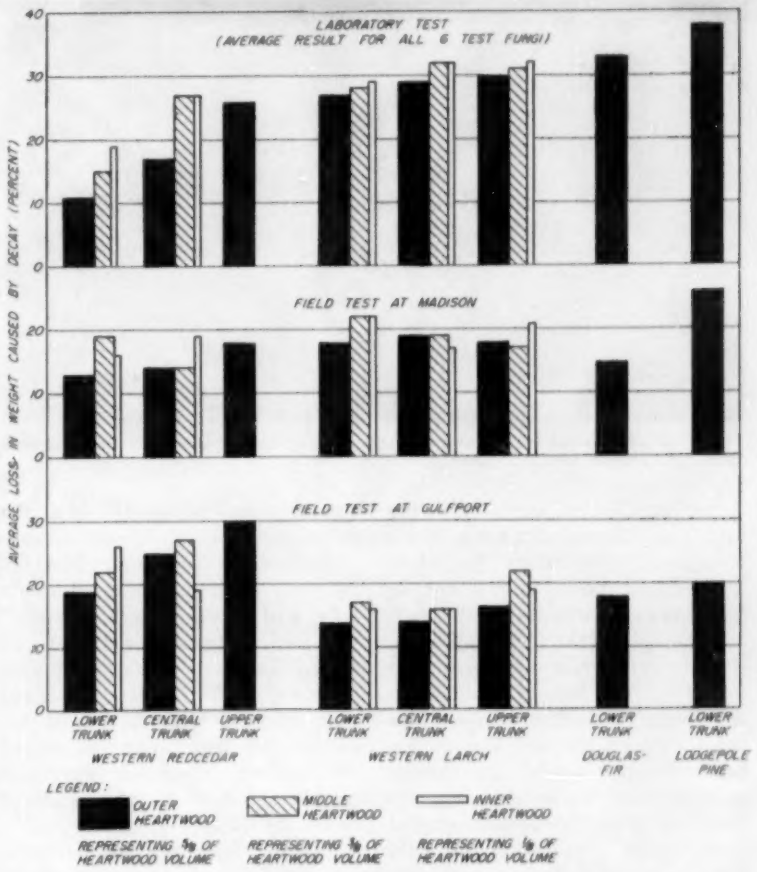


FIG. 1.—Graphic comparison of decay resistance in the tested woods (based on Table 2).

Decay resistance in relation to tree, wood character.—In none of the woods was there an evident relation between decay resistance and the growing site of the tree, or the age or size of the tree. Absence of any correlation with age or size was surprising in view of the wide ranges dealt with and the fact that age and size are known to be prominent factors in certain other woods[5, 6] and weak factors in Douglas-fir.[4] Presumably some correlations would have been disclosed had a larger number of trees been tested, but it is apparent that they would be over-shadowed by differences in resistance that are inherited or more closely tied to other factors.

The resistance of western redcedar and western larch was weakly related to the rate at which the wood was grown, being slightly greater as the number of rings per inch was greater. It was related in a well defined manner to specific gravity in western larch, and less plainly in the Douglas-fir and lodgepole pine—which were represented by fewer trees. There was no evidence of a resistance-gravity relation in the redcedar. It should be pointed out here that specific gravity of itself seems not to be much of a factor of decay resistance but in some woods there may be indirect correlation because of a relation between gravity and the chemical constituency primarily responsible for the decay resistance of the wood.

Of the 15 western redcedar trees and 18 western larch trees, 6 of each species contained so-called "internal sapwood," which showed in cross section as concentric bands of light wood interspersed with the darker heartwood (Fig. 2). This internal sapwood had no more resistance to decay than normal sapwood, hence it would detract from the overall decay resistance of a pole, especially if one of the bands were close enough to the heartwood boundary to be reached by seasoning checks. Heartwood adjacent to bands of internal sapwood was normal in its resistance to decay.

Discussion and Conclusions

The levels of decay resistance indicated by the laboratory test for western redcedar and Douglas-fir are in line with findings for a

[5] Scheffer, Theodore C. and Henry Hopp. Decay resistance of black locust heartwood. U. S. Dept. Agric. Tech. Bul. 984. 37 pp. 1949.

[6] Scheffer, Theodore C., Geo. H. Englerth, and Catherine G. Duncan. Decay resistance of seven native oaks. Jour. Agric. Res. 78(5 and 6) :129-152. 1949.

FIG. 2.—Basal sections from western redcedar (left) and western larch trees showing bands of so-called internal sapwood.

larger number of samples of the same woods from other areas. Comparable supplementary test data for western larch and lodgepole pine have not been gathered, but it may be noted that the relative resistance exhibited by these two woods in the present tests is in agreement with their reputations for decay resistance. Except for the western redcedar, differences in resistance displayed among the four woods in the laboratory test were similar to those in the field tests. As the laboratory evidence in all respects conforms to the limited information from other sources about the woods, it probably is a fairly representative portrayal of differences to be found among the species in most kinds of service.

A very general appraisal of the decay resistance of the four woods is perhaps sufficient for the practical needs of the pole producer and user. For such an appraisal the resistance of the outer heartwood should be emphasized, since the outer heartwood, as here sampled, not only constitutes more than half the heartwood volume but serves as the "front-line" barrier to heartwood infection in a pole. From this point of view, therefore, and judging western redcedar mainly from the evidence of the laboratory test, the resistance of the heartwood of the different woods to decay in poles appears to be most commonly as follows:

Resistant: Western redcedar in the lower and middle thirds of the pole.

Moderately resistant: Western redcedar in the upper third of the pole, and western larch, Douglas-fir, and lodgepole pine at all heights in the pole. Lodgepole pine appeared to be the least resistant and western larch the most resistant of the three last-named woods, but differences were not large, especially for the range of moderate decay resistance.

In the foregoing comparisons, no point is made of the moderate to low decay resistance exhibited by western redcedar in some of the field tests, because it was felt that those results were not representative of redcedar performance in pole sizes. The field results undoubtedly depict the situation correctly for western redcedar heartwood stakes of small size; therefore, the indicated loss of redcedar decay resistance through leaching should be kept in mind when using this species in damp ground. Nevertheless, in view of the reputation of the wood for decay resistance, redcedar probably does not suffer marked loss of decay resistance when used in post and larger sizes. Perhaps the greater reservoir of natural preservatives in large material keeps the outer wood resistant to fungus attack for longer periods than are typical of small material like test stakes. But whatever advantage large size may be for maintaining decay resistance in western redcedar, preservative treatment of the sapwood of round items like poles should have considerable influence. Leaching of the heartwood hardly can be much of a factor through the overlying sound sapwood, especially if the sapwood has received an oil-type preservative. Experimental evidence to this effect was found by one of the writers in redcedar poles that had been in line 20 to 30 years.

The likelihood of heartwood decay in a pole is determined not only by the decay resistance of the heartwood but also by the extent to which the heartwood may be exposed to infection through checking or other rupturing of the protecting cover of treated sapwood. It is not a function of this paper to speculate on the relative significance of the latter factor for the four pole species being considered. However, it seems appropriate to point out the sapwood thickness of the respective woods, since this bears strongly on the situation. From data furnished by Hearn,[7] common depths of sapwood are approximately as follows: western redcedar—0.73 inch, western larch—0.70 inch, Douglas-fir (mainly Coast type)—1.29 inches, and lodgepole pine—1.30 inches. Limited data gathered at the Forest Products Laboratory on pole-size material indicate that the sapwood thickness of Rocky Mountain type Douglas-fir tends to be substantially less than that of Coast type.

Summary

To compare the natural decay resistance of heartwood of western redcedar, western larch, Douglas-fir,[*] and lodgepole pine, accelerated decay tests were made on samples from pole-size trees of these species growing in the Inland Empire. Emphasizing the outer heartwood because of its strategic position, two general classes of decay resistance were indicated: ***resistant***, represented by the redcedar from the lower and middle thirds of the

[7] Hearn, A. H. Relationship between sapwood thickness and depth of preservative penetration in Pacific Coast Douglas-fir poles. Proc. Am. Wood. Pres. Assn. 47:135-151, table 17. 1951.

pole, and *moderately resistant*, represented by the redcedar from the upper part of the pole and by the other woods from all parts of the pole. Among the species other than western redcedar, larch tended to be most resistant and lodgepole pine least resistant, but these differences usually were not large and were not consistent for all tests. Differences in sapwood thickness and checking tendencies also would be important factors in determining how these species would perform as poles.

There were prominent radial as well as vertical differences in the resistance of western redcedar, the outer heartwood being most resistant and the inner heartwood least resistant. Differences of the same type, but lesser magnitude, occurred in western larch. There was no apparent relation between decay resistance and the growing site of the tree, or the age or size of the tree in any of the woods. Decay resistance was plainly correlated with the specific gravity of the wood in western larch but not with that of the other species.

Internal sapwood present in several western redcedar and western larch trees was no more resistant to decay than normal sapwood. The interior decay resistance of a pole containing internal sapwood would, therefore, be less than that of a pole without it.

SECTION BOX SCORE[1] 1955 MEMBERSHIP

Section	Applications received[2] August 1955	Total 1954	Total 1955
Allegheny	2	72	43
Appalachian	2	69	8
Central Rocky Mountain	0	26	6
Central States	1	115	18
Columbia River	10	57	67
Gulf States	1	63	80
Inland Empire	4	40	8
Intermountain	0	15	18
Kentucky-Tennessee	1	5	5
New England	1	54	40
New York	3	39	32
Northern California	2	24	29
Northern Rocky Mountain	1	34	37
Ozark	3	42	18
Puget Sound	4	69	49
Southeastern	0	130	32
Southern California	0	2	3
Southwestern	0	7	11
Upper-Mississippi Valley	3	55	34
Washington	0	8	2
Wisconsin-Michigan	2	13	24
Totals	40	939	564

[1]Adjusted to new record year—now calendar-year basis.

[2]Student, Junior, Affiliate, Associate (initial) grades only.

SCHOOL BOX SCORE[1] 1955 MEMBERSHIP

School	Student applications received August 1955	Total 1954	Total 1955
Alabama Polytechnic Institute	0	25	0
University of California	1	11	17
Colorado A & M College	0	18	5
Duke University	0	13	2
University of Florida	0	8	7
University of Georgia	0	35	11
University of Idaho	1	29	4
Iowa State College	3	21	15
Louisiana Polytechnic Institute	0	0	13
Louisiana State University	0	14	30
University of Maine	0	20	12
University of Massachusetts	0	12	4
Michigan State College	0	43	10
University of Michigan	2	28	14
University of Minnesota	0	23	11
University of Missouri	0	14	3
Montana State University	1	19	21
State University of New York	2	22	23
North Carolina State College	0	39	0
Oregon State College	7	18	19
Pennsylvania State University	2	37	32
Purdue University	1	26	4
Utah State Agricultural College	0	9	12
University of Washington	0	35	22
West Virginia University	0	22	6
Yale University	0	4	16
Totals	20	545	313

[1]Adjusted to new record year—now calendar-year basis.

Growth and Yield of Plantation-Grown Red Pine at Various Spacings[1]

W. R. Byrnes and W. C. Bramble
Department of Forestry,
The Pennsylvania State University,
University Park

THIS REPORT is the third in a series describing the growth and development of red pine planted at various spacings in central Pennsylvania. These plantings were established in 1921 with 3-0 stock. Four plots, each 0.13 acres, were laid out and planted at spacings of 5-by-5, 6-by-6, 6-by-8, and 10-by-10 feet.

Two previous reports (*4*) and (*1*) present data of the effects of various spacings at 16 years and 25 years respectively. Both of these earlier reports indicate a superior growth rate of trees spaced 10-by-10 feet. This present report describes the condition of the plots at the end of the 1951 growing season when 30 years of age (Figure 1).

[1]Authorized for publication March 1954 as Paper No. 1866 in the Journal Series of The Pennsylvania Agricultural Experiment Station.

Growth and Yield

Diameter growth through the thirtieth year, as indicated by the average diameter at breast height, is in favor of the wider spacings of 10-by-10 and 6-by-8 feet over the narrower spacings of 5-by-5 and 6-by-6 feet (Table 1). At 30 years the average d.b.h. of trees in the 10-by-10-foot spacing was 3.02 inches larger than trees in the 5-by-5-foot spacing, 2.44 inches larger than trees in the 6-by-6-foot spacing and 1.70 inches larger than trees in the 6-by-8-foot spacing. In the 6-by-8-foot spacing, the average d.b.h. of trees was 1.32 inches larger than trees in the 5-by-5-foot spacing and 0.74 inches larger than trees in the 6-by-6-foot spacing. Average d.b.h. of trees in the 6-by-6-foot spacing was 0.58 inches larger than trees in the 5-by-5-foot spacing.

Between 16 and 25 years of age a greater height growth occurred in the wider spacings of 6-by-8 and 10-by-10 feet. This increase has continued and now at 30 years the average height of the 10-by-10 spacing is 5.4 feet larger than the 5-by-5, 4.6 feet larger than the 6-by-6 and 1.4 feet larger than the 6-by-8-foot spacing, while the 6-by-8-foot spacing is 4.0 feet and 3.2 feet larger than the 5-by-5 and 6-by-6 (Table 1). When comparing the average height of crop trees (Table 2) which were selected to total 200 per acre, there was very little difference between the 5-by-5, 6-by-8 and 10-by-10-foot spacing. The 6-by-6-foot spacing, however, had fallen behind and at this age was 3.5 feet smaller than the 10-by-10, 2.9 feet smaller than the 6-by-8 and 3.0 feet smaller than the 5-by-5.

As mentioned in a previous report (*1*), these plots were not designed for statistical analysis. However, by subjecting the data to Fisher's *t*-test for single group comparisons, an indication of significance of the differences in average d.b.h. and average height is obtained (Table 3).

Mortality in the past 5 years has been greatest in the 5-by-5-foot spacing, where 143 trees per acre have died, as compared to 28 in the 6-by-6 and none in the 6-by-8 and 10-by-10-foot spacings. During a severe windstorm in November, 1950, 72 trees per acre were lost in the 6-by-6-foot spacing. All other spacings withstood this storm with little or no damage. Trees in the 10-by-10-foot spacing were particularly windfirm, while a few trees on the borders, not included in the

TABLE 1.—AVERAGE DIAMETERS AND AVERAGE HEIGHTS ON UNTHINNED SPACING PLOTS AT FIVE AGES

Spacing (Feet)	Average d.b.h. (inches)					Average height (feet)				
	8 yrs.	11 yrs.	16 yrs.	25 yrs.	30 yrs.	8 yrs.	11 yrs.	16 yrs.	25 yrs.	30 yrs.
5 by 5	1.25	2.25	3.72	4.47	5.08	8.0	12.8	21.9	30.4	36.9
6 by 6	1.35	2.59	4.16	5.06	5.66	7.5	13.2	22.1	31.7	37.7
6 by 8	1.45	2.49	4.49	5.88	6.40	7.8	12.5	22.0	33.8	40.9
10 by 10	1.51	3.01	5.58	7.23	8.10	8.1	13.7	23.2	33.8	42.3

TABLE 2.—COMPARISON BETWEEN AVERAGE DIAMETERS, HEIGHTS, BASAL AREAS, AND VOLUME OF SELECTED CROP TREES ON UNTHINNED SPACING PLOTS AT 30 YEARS OF AGE

Spacing	Average height	Average d.b.h.	Basal area per acre	Volume per acre
Feet	*Feet*	*Inches*	*Square feet*	*Cubic feet*
5 by 5	43.3	6.60	48.2	977
6 by 6	40.3	6.52	47.0	888
6 by 8	43.2	7.27	57.7	1,148
10 by 10	43.8	8.78	78.2	1,543

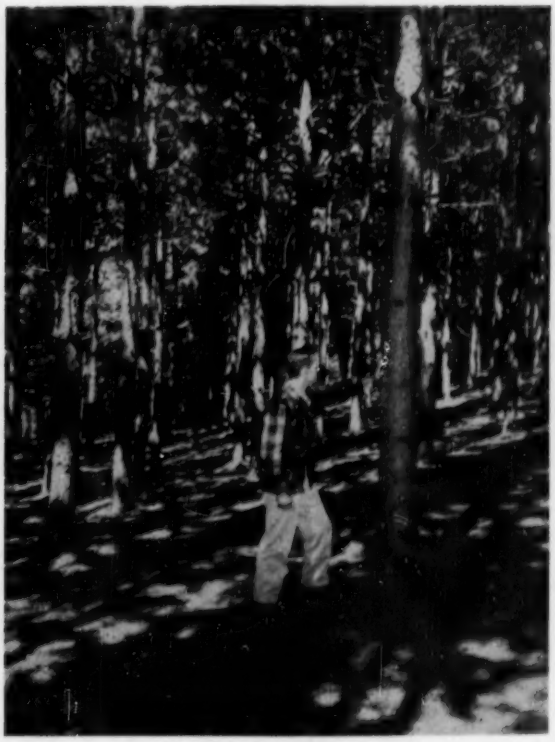
TABLE 3.—COMPARISON OF THE DIFFERENCES BETWEEN SPACINGS AT 30 YEARS

Comparison of spacings	Average d.b.h.			Average height		
	Difference between means	Standard error of difference	Significance	Difference between means	Standard error of difference	Significance
5 by 5 with 6 by 6	0.58	0.171	Highly significant	0.8	0.622	Not significant
5 by 5 with 6 by 8	1.32	0.125	Highly significant	4.0	0.439	Highly significant
5 by 5 with 10 by 10	3.02	0.123	Highly significant	5.4	0.591	Highly significant
6 by 6 with 6 by 8	0.74	0.129	Highly significant	3.2	0.461	Highly significant
6 by 6 with 10 by 10	2.44	0.127	Highly significant	4.6	0.612	Highly significant
6 by 8 with 10 by 10	1.70	0.029	Highly significant	1.4	0.448	Highly significant

A—5-by-5-foot spacing

B—6-by-6-foot spacing

C—6-by-8-foot spacing



D—10-by-10-foot spacing

FIG. 1.—Red pine spacing plots at 30 years. Trees at which the man is standing were photographed at equal distances from the camera.

spacing plots, of the 5-by-5 and 6-by-8 were windthrown.

In total cubic-foot volume, the 10-by-10-foot spacing is still maintaining the greatest rate of increase. As calculated by Pressler's formula, the growth rate for this spacing is 8.7 percent for the period 25 to 30 years. The 5-by-5-foot spacing, which exhibited a high rate of increase in diameter and height for this 5-year period, also shows a volume growth rate of 7.4 percent. This is followed by the 6-by-8 spacing with 7.0 percent increase and the 6-by-6 spacing with 6.8 percent increase in volume.

Total cubic-foot volume, as computed from volume tables for plantation-grown red pine in Connecticut (*2, 3*), is presented in Table 4. The greatest cubic-foot volume at 30 years is found in the 6-by-6-foot spacing which has 1,172 trees per acre. The 6-by-6-foot spacing with 838 trees per acre has the next greatest volume, followed by the 5-by-5 spacing with 1,315 trees per acre, then the 10-by-10 spacing with 474 trees per acre.

When the volumes of trees 7 inches d.b.h. and over are compared (Table 5, Fig. 2) an interesting distribution of volume of practical importance is revealed. In the 10-by-10-foot spacing there were 423 trees per acre over 7 inches d.b.h., having a volume of 34.8 standard cords. For the 6-by-8 spacing with 241 trees per acre, the volume was 16.1 cords, or less than one-half the volume of the 10-by-10-foot spacing. The 6-by-6 and 5-by-5-foot spacings had 100 and 71 trees per acre respectively over 7 inches d.b.h. and volumes of only 7.2 and 5.2 cords per acre. This definitely indicates that at wide spacings, it is possible to produce acceptable yields of red pine in merchantable pulpwood sizes in 30 years in central Pennsylvania.

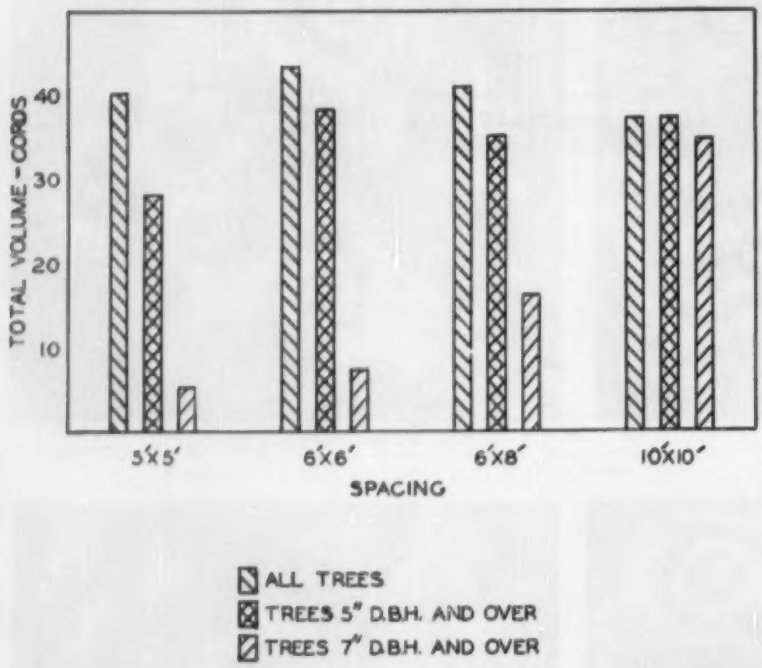


FIG. 2.—Comparison of total volume in standard cords of four red pine spacing plots at 30 years.

TABLE 4.—TOTAL VOLUME OF RED PINE ON UNTHINNED SPACING PLOTS AT FOUR AGES ALL TREES

Spacing (Feet)	Total volume per acre			
	11 years	16 years	25 years	30 years
	Cubic feet			
5 by 5	522	1,432	2,494	3,628
6 by 6	515	1,258	2,769	3,899
6 by 8	397	1,187	2,509	3,691
10 by 10	247	1,811	2,153	3,357

Summary

The growth and development of plantation-grown red pine spaced 5-by-5, 6-by-6, 6-by-8 and 10-by-10 feet in central Pennsylvania have been reported at 16 and 25 years. This third report describes the condition of these spacing plots when 30 years of age.

Diameter growth over this 30-year period has been consistently in favor of the wider spacings of 6-by-8 and 10-by-10 feet. At 30 years the average d.b.h. of trees in the 10-by-10 spacings was 2.44 inches larger than for the generally

TABLE 5.—VOLUME AND GROWTH OF RED PINE ON SPACING PLOTS OVER THIRTY-YEAR PERIOD

Spacing (Feet)	Total volume per acre						Mean annual growth per acre					
	All trees		Trees 5" d.b.h. and over		Trees 7" d.b.h. and over		All trees		Trees 5" d.b.h. and over		Trees 7" d.b.h. and over	
	Cu. ft.	Cords[1]	Cu. ft.	Cords[1]	Cu. ft.	Cords[1]	Cu. ft.	Cords[1]	Cu. ft.	Cords[1]	Cu. ft.	Cords[1]
5 by 5	3628	40.3	2532	28.1	467	5.2	121	1.34	84	0.94	16	0.17
6 by 6	3899	43.3	3438	38.2	646	7.2	130	1.44	115	1.27	22	0.24
6 by 8	3691	41.0	3161	35.1	1445	16.1	123	1.37	105	1.17	48	0.54
10 by 10	3357	37.3	3357	37.3	3128	34.8	112	1.24	112	1.24	104	1.16

[1]Standard cord: 90 cubic feet solid wood.

used spacing of 6-by-6 feet. Average d.b.h. of trees in the 6-by-8 spacing, although being 1.70 inches smaller than the 10-by-10, was 0.74 inches larger than the 6-by-6.

The average height of all trees in the various spacings was closely related up to the sixteenth year. Between 16 and 25 years the wider spacings showed a larger increase in height growth which has been maintained through the thirtieth year. The average height of trees in the 10-by-10 spacing at 30 years was 4.6 feet larger than the 6-by-6. In the 6-by-8 spacing, the average height was 1.4 feet smaller than the 10-by-10, but 3.2 feet larger than the 6-by-6. For selected crop trees, there was very little difference in average height between the 5-by-5, 6-by-8, and 10-by-10 spacings. Average height of crop trees in the 6-by-6 spacing, however, had fallen slightly behind.

In volume production the 10-by-10 spacing has a very definite advantage over the narrower spacings when trees 7 inches d.b.h. and over are compared. At 30 years the 10-by-10 trees 7 inches d.b.h. and over had a volume of 34.8 standard cords per acre, which is more than double the volume of the 6-by-8 spacing. The 5-by-5 with 5.2 cords per acre and the 6-by-6 with 7.2 cords per acre in trees 7 inches d.b.h. and over were far behind the wider spacings. This indicates that at wide spacings, it is possible to produce acceptable yields of red pine in merchantable pulpwood sizes in 30 years in central Pennsylvania.

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STUDENT MEMBERSHIP
(As of May 24, 1955)

School	Eligibles	Student members	Percent of members (Rounded off)
Alabama Polytechnic Institute	27	24	90
University of California	46	31	70
Colorado A & M College	63	22	35
Duke University	11	8	73
University of Florida	22	17	80
University of Georgia	65	35	54
University of Idaho	31	18	60
Iowa State College	65	33	50
Louisiana Polytechnic Institute	19	12	63
Louisiana State University	41	40	100
University of Maine	56	28	50
University of Massachusetts	38	15	40
Michigan State College	60	62	100
University of Michigan	46	29	63
University of Minnesota	40	25	62
University of Missouri	32	31	100
Montana State University	98	28	28
State University of New York	99	43	44
North Carolina State College	59	37	63
Oregon State College	81	25	30
Pennsylvania State University	104	50	50
Purdue University	51	37	73
Utah State Agricultural College	28	19	69
University of Washington	88	50	60
West Virginia University	29	23	90
Yale University	29	18	62
Total	1,328	760	57

A Preliminary Stand Classification for Lodgepole Pine in the Intermountain Region

David Tackle
Intermountain Forest and Range Experiment Station, Forest Service, U. S. Department of Agriculture
Ogden, Utah

Differences in age, composition, density, and other attributes commonly occur between forest stands. Unless forest researchers and managers understand these differences they are handicapped in their respective tasks of developing and applying proper stand management techniques. A classification that defines the various stands within a forest type and describes how they may be easily identified can be of great assistance. Such a classification for the lodgepole pine stands in the Intermountain region is presented here.

IN THE INTERMOUNTAIN region, comprising the states of Nevada and Utah, Idaho south of the Salmon River, and western Wyoming, the lodgepole pine (*Pinus contorta* Dougl.) type occupies some 4 million acres of extensively managed forest land. Information on the structure, composition, and growth rates of these stands is limited. For more than 50 years recommendations from other regions have guided forest management efforts within the Intermountain lodgepole pine type. Because of the apparent homogeneity of this type marking rules were not varied to any appreciable degree. The primary aim in early cutting was to supply markets with lumber, railroad ties, and roundwood products such as mine props, corral poles, and fence posts; little attention was given to stand condition.

Only recently have the advantages of differentiating between lodgepole pine stands been appreciated and stressed. In Colorado, Lexen (*3*) distinguished between even-aged and broad-aged[1] stands in a comprehensive discussion of alternate clear-strip cutting in the lodgepole pine type. He clearly presented the implications of the age- and diameter-class distributions of these stands in this system of clearcutting. LeBarron (*2*), in recommending silvicultural practices for this species in Montana, also distinguished between even-aged and uneven-aged stands and between stands of pure and mixed composition.

In order to gain the proper perspective for making detailed silvical observations in Intermountain lodgepole pine stands, and to segregate them for inventory purposes, they were classified according to their present age-structure and composition. This classification was prepared as an integral part of a problem analysis of lodgepole pine management in the Intermountain region (*5*). It was designed to clarify the seemingly complex array of stand conditions found in lodgepole pine here and includes both natural and cutover stands.

Factors Causing Stand Variation

In addition to age, the principal factors causing differences between lodgepole pine stands are: (1) elevation, (2) aspect, (3) fire, (4) cutting, (5) insects, (6) disease, (7) wind, (8) snow, and (9) soil.

Elevation and aspect affect stand composition. In this region the lodgepole pine type is described as a discontinuous belt of relatively pure stands bordered above and below by mixed stands. The species merges with ponderosa pine (*Pinus ponderosa* Laws) and Douglas-fir (*Pseudotsuga menziesii* var. *glauca* [Beissn.] Franco) at the lower part of its elevational range, and Engelmann spruce (*Picea engelmannii* Parry) and alpine fir (*Abies lasiocarpa* [Hook.] Nutt.) at the upper limit. Lodgepole pine mixed with Engelmann spruce and alpine fir is found as high as 10,500 feet above sea level in the southern limit of the type in Utah, and mixed with Douglas-fir it is found as low as 4,500 feet above sea level in the northern part of the region in Idaho. Local variations are often caused by aspect, since canyon bottoms and north and northeast slopes favor development of mixed stands.

Fire and cutting are the chief factors that bring about the more rapid changes in stand density; their usual results (burned snags or "down" timber, fire scars on standing trees, charcoal, or stumps and logs) remain apparent for many years. Insects may also effect rapid changes but only when severe epidemics occur. In pure stands, past, sudden reductions in stand density are evidenced usually by one or more crown canopy strata. Fundamentally these strata develop because lodgepole pine is shade-intolerant and a large amount of the seed produced in a stand is borne in serotinous cones.

Insects, disease, wind, and snow can produce gradual stand deterioration. These agents are therefore responsible for the more-or-less constant and normal mortality within stands. Effects of their action are evident especially in the formation of uneven-aged lodgepole pine stands.

The effect of soil factors on stand variation is not too well understood. There is evidence, for example, that soil type affects certain reproductive processes such as cone production and cone opening (*1, 6*), but whether these effects are sustained over wide areas of similar soil type is not known. Likewise, knowledge of the part that soil plays in determining site quality is limited. In fact, practical methods of site determination in lodgepole pine have yet to be formulated.

[1] The term "broad-aged" implies an uneven-aged condition, although it is not included in the recognized list of forestry terms (*4*). It is more descriptive than the term uneven-aged, however, when applied to lodgepole pine, as a range of 100 to 250 years in the age of trees is not uncommon in uneven-aged lodgepole stands. Lexen's discussion of the characteristics of these stands formed the framework for the stand descriptions presented in this paper.

The Classification

Composition and age were the two main attributes used in composing the classification. The following discussion shows how these two factors are used in the classification chart (Figure 1) and exemplifies how they are applied when classifying stands.

Composition.—Stands are divided into the two conventional categories—pure and mixed. Pure stands appear on the left side and mixed stands on the right side in Figure 1. Mixed stands are those in which either of the following conditions prevail:

1. Less than 80 percent lodgepole pine in the overstory by either number of stems or volume.
2. An overstory of pure lodgepole pine and an understory of a different species.

Thus, a stand with 70 percent lodgepole pine, 20 percent Engelmann spruce, and 10 percent alpine fir in the overstory is a mixed stand. A stand with an even-aged overstory of pure lodgepole pine and an understory of alpine fir is also a mixed stand.

Age.—Conventional terms are used to define age. Four age groups are recognized—young (under 40 years), immature (40-120 years), mature (120-140 years), and overmature (over 140 years). The numerical expressions of age are tentative and are included only as a guide, since little work has been done on age relationships for lodgepole pine in this region.

Stand age is designated according to the age of the overstory, or in single-storied stands of more than one age class, according to the oldest age class. Age determinations are made with an increment borer.

Age-class structure is usually apparent by the storying effect common to stands that have been subjected to past fires or cutting. Only where enough time has elapsed for the younger trees to reach the same general height level as the original overstory, is age-class structure less obvious. This situation occurs mainly in older stands. For example, some pure, uneven-aged, mature, or overmature stands on cursory examination appear to be even-aged because of their single-storied appearance; more critical inspection, however, will show that the younger trees in these stands have reached virtually the same crown canopy level as trees in the older age classes.

Stand Descriptions

Except for their absolute age, stand classes are determined ocularly. The eleven principal classes are characterized below in six groups, starting with the pure, mature, or overmature group in the upper left part of Figure 1. Referring to Figure 1 the sequence of stand descriptions by groups is as follows: Upper left, upper right, center left, center right, lower left, lower right. Within each group the stand class with the simplest age-structure is presented first.

Mature or Overmature

Pure

Even-aged. — Generally single-storied.

a. Uniform appearance in diameter, and crown length.

b. Live crown length generally short to medium (30-60 percent of tree height); boles may be clear for 10-40 percent of tree height.

c. Limbs fine in appearance except in very old stands.

d. Few or no coarse-limbed wolf trees throughout the stand.

e. Uniform stocking, except in very old stands.

Two-aged. — Generally two-storied but may be single-storied.

a. Two-storied—the younger aged trees occur exclusively as understory, may be either immature or young, and are of smaller diameter than the old-growth. The overstory resembles an even-aged stand.

b. Single-storied — the younger aged trees are immature, have finer limbs than the old-growth, and may or may not be of diameter equal to the old-growth. Otherwise resembles an even-aged stand.

Three-aged. — Generally three-storied but may be two-storied.

a. Three-storied — overstory is mature or overmature; middlestory is immature; understory is young.

b. Two-storied—overstory is two-aged, the younger trees immature; understory is young.

Uneven-aged.—Generally multi-storied but may be single-storied.

a. Greater range in diameter classes than in even-aged stands.

b. Original seed trees are present and are large-sized and coarse-limbed.

c. Fill-in trees are better formed and finer-limbed than original seed trees.

d. If original stand is quite dense there is little difference between old and new stand.

e. If uneven-aged condition is caused by gradual deterioration of an even-aged stand, nearly all the healthy, fast growing trees are below saw-log size.

f. Occasionally stocking may be irregular.

Mixed

Two-aged. — Generally two-storied.

a. Overstory is pure mature or overmature lodgepole pine; understory is immature or young—Douglas-fir at lower elevations, and alpine fir, or a mixture of alpine fir and Engelmann spruce at higher elevations.

Uneven-aged.—Generally multi-storied.

a. Less than 80 percent lodgepole pine in the overstory either by number of stems or volume.

b. Otherwise has same basic characteristics indicated for pure, uneven-aged, stands.

Immature

Pure

Even-aged. — Generally single-storied.

a. Same description as for even-aged, mature or overmature stands except the younger immature stands are more densely stocked and less naturally pruned.

Two-aged.—Either single-storied or two-storied.

a. If single-storied, results of fire (scars and charcoal) often ap-

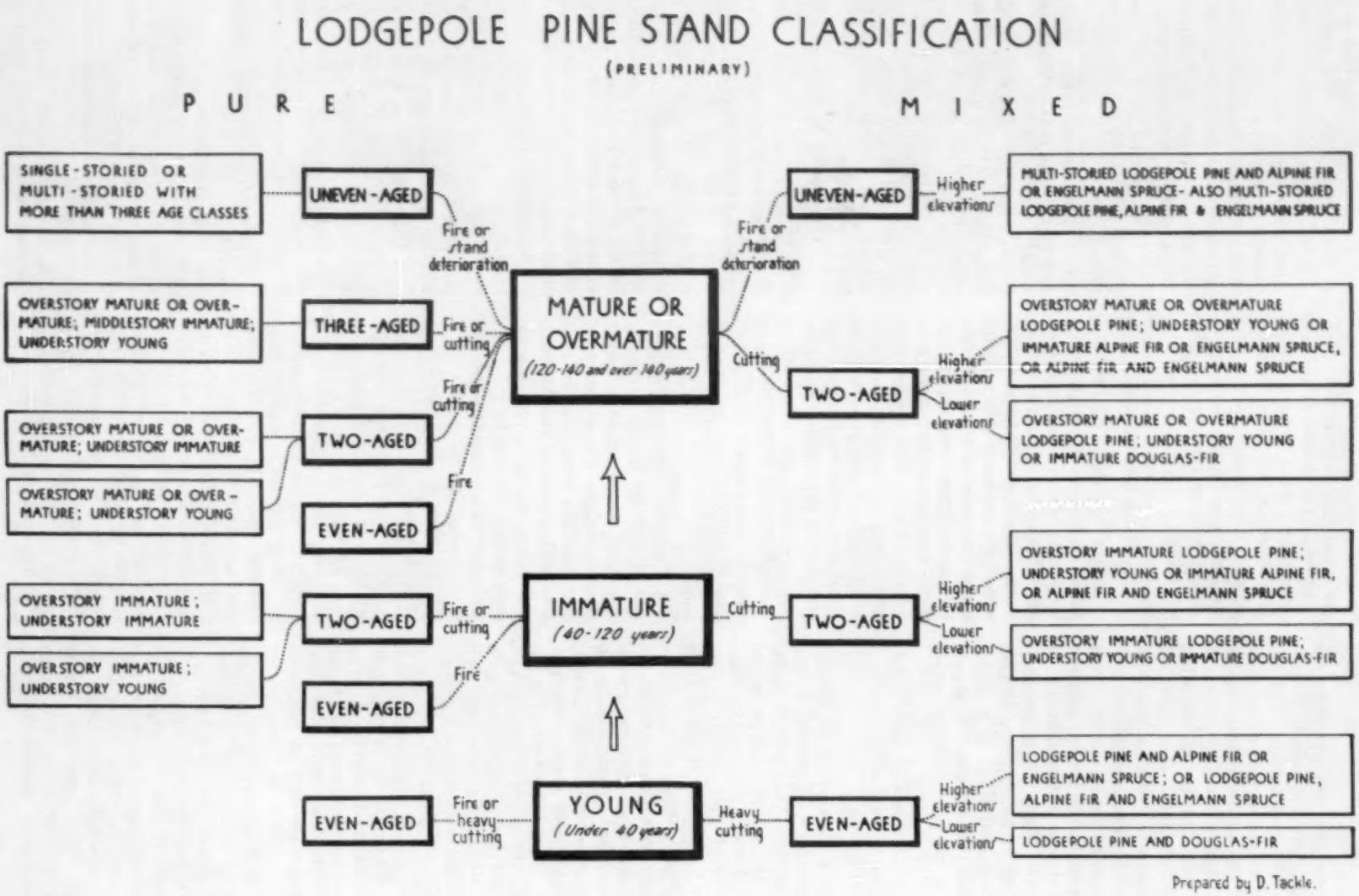
LODGEPOLE PINE STAND CLASSIFICATION
(PRELIMINARY)
PURE
MIXED
SINGLE-STORIED OR MULTI-STORIED WITH MORE THAN THREE AGE CLASSES
UNEVEN-AGED
OVERSTORY MATURE OR OVER-MATURE; MIDDLESTORY IMMATURE; UNDERSTORY YOUNG
THREE-AGED
OVERSTORY MATURE OR OVER-MATURE; UNDERSTORY IMMATURE
OVERSTORY MATURE OR OVER-MATURE; UNDERSTORY YOUNG
TWO-AGED
EVEN-AGED
Fire or stand deterioration
Fire or cutting
Fire or cutting
Fire
MATURE OR OVERMATURE
(120-140 and over 140 years)
Fire or stand deterioration
Cutting
UNEVEN-AGED
Higher elevations
MULTI-STORIED LODGEPOLE PINE AND ALPINE FIR OR ENGELMANN SPRUCE- ALSO MULTI-STORIED LODGEPOLE PINE, ALPINE FIR & ENGELMANN SPRUCE
TWO-AGED
Higher elevations
OVERSTORY MATURE OR OVERMATURE LODGEPOLE PINE; UNDERSTORY YOUNG OR IMMATURE ALPINE FIR OR ENGELMANN SPRUCE, OR ALPINE FIR AND ENGELMANN SPRUCE
Lower elevations
OVERSTORY MATURE OR OVERMATURE LODGEPOLE PINE; UNDERSTORY YOUNG OR IMMATURE DOUGLAS-FIR
OVERSTORY IMMATURE; UNDERSTORY IMMATURE
OVERSTORY IMMATURE; UNDERSTORY YOUNG
TWO-AGED
EVEN-AGED
Fire or cutting
Fire
IMMATURE
(40-120 years)
Cutting
TWO-AGED
Higher elevations
OVERSTORY IMMATURE LODGEPOLE PINE; UNDERSTORY YOUNG OR IMMATURE ALPINE FIR, OR ALPINE FIR AND ENGELMANN SPRUCE
Lower elevations
OVERSTORY IMMATURE LODGEPOLE PINE; UNDERSTORY YOUNG OR IMMATURE DOUGLAS-FIR
EVEN-AGED
Fire or heavy cutting
YOUNG
(Under 40 years)
Heavy cutting
EVEN-AGED
Higher elevations
LODGEPOLE PINE AND ALPINE FIR OR ENGELMANN SPRUCE; OR LODGEPOLE PINE, ALPINE FIR AND ENGELMANN SPRUCE
Lower elevations
LODGEPOLE PINE AND DOUGLAS-FIR
Prepared by D. Tackle.

FIG. 1.—Lodgepole pine stand classification.

parent on some of the older trees, or if caused by cutting, stumps present. Lower age class may be immature or young.

b. Two-storied stands are self apparent. Generally understory is in young age class.

Mixed

Two-aged.—Generally two-storied.

a. Overstory immature lodgepole pine; understory young or immature alpine fir or a mixture of alpine fir and Engelmann spruce.

b. At lower elevations the understory may be young or immature Douglas-fir.

Young

Pure

Even-aged. — Generally single-storied.

a. Generally, though not always, extremely dense.

b. Trees of small diameter and height, with long crowns, pointed tops, and little or no natural pruning.

c. Remnants of prior stand present in form of dense "down" timber, burned snags or scattered large trees, or stumps in case of cutover areas.

Mixed

Even-aged. — Generally single-storied.

a. At higher elevations lodgepole pine and alpine fir, or lodgepole pine, alpine fir, and Engelmann spruce.

b. At lower elevations lodgepole pine and Douglas-fir.

c. Usually not uniformly stocked since stand condition is result of heavy cutting of a mixed two-aged stand.

Usefulness of the Classification

Though a forest stand classification can serve many purposes, primarily it enables the forester to see the nature of the growing stock more clearly. This is a consequential first step in the management of any forest species. The systematic arrangement of lodgepole pine stands in the classes indicated in Figure 1 should prove helpful in both forest research and silvicultural management in the Intermountain region. In research, classification is a necessary part of methodology because it provides a common basis for designating factors being observed and is of great descriptive and analytical value. The classification will enable investigators to restrict their study, where necessary, to clearly defined stands.

For the forest manager the classification should be useful for mapping and inventory purposes. It should also facilitate the assignment of cutting priorities within a management unit and give some indication of the broad cultural treatments necessary for each stand. For example, if even-aged forestry is accepted as the best course to follow in lodgepole pine management, as presently indicated, initial stand treatments for some stands can be reasoned from the classification itself. Cutting trials augmented by detailed analyses are, of course, the next step in the development of sound management practices.

Applicability Elsewhere

Although based upon data obtained from stands within the Intermountain region the classification should be applicable with little modification, if any, to lodgepole pine stands elsewhere. It is certain that throughout the commercial range of the species pure stands will be found which will fall into the classes shown on the left side of the classification chart.

The classification also gives some clues to certain stand conditions that will be met in developing forest management techniques in mixed stands. The fact that little experimental work has been done in these stands, coupled with their greater variability may make them more difficult to classify. With study, however, they can be suitably placed.

Summary

A preliminary stand classification based upon age-structure and composition is presented for the lodgepole pine stands in the Intermountain region. The principal factors which cause stand variation (elevation, aspect, fire, cutting, insects, disease, wind, snow, and soil) are discussed and stand descriptions are presented. The usefulness and applicability of the classification are described.

Although prepared with data from stands within the Intermountain region the classification should be applicable with little modification to stands elsewhere within the lodgepole pine type.

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Results of an Investigation of the Variable Plot Method of Cruising[1]

Bertram Husch
Associate professor of forestry,
Department of Forestry,
University of New Hampshire,
Durham

One of the major activities of forestry is the determination of the volume of timber present on an area of land. Knowledge of timber volumes is essential in carrying out many phases of forest management. Forest industries and timberland owners depend on volume estimates in planning their business programs and policies. In short, timber inventories form a basic requirement in all phases of forestry.

The procedure of estimating timber volumes is an expenditure which in itself gives no return but forms the basis for some other activity which will yield a return. For this reason it is important that the cost of obtaining information of this type be kept at a minimum or at least commensurate with the value of the timber.

The problem then is to decide what procedure will yield information of sufficient accuracy to be useful and at the same time be within the range of economic possibility.

Within recent years a new approach has been proposed which has promise of speeding up timber volume estimation (*2*). This method needs trial in this country specifically to determine its best form of application and to compare the results obtainable with it to the results from other conventional methods.

Several studies of methods of timber cruising based on statistical techniques allowing a determination of sampling error have been carried out during the last quarter of a century. An early study in 1925 by Wright compared strip and plot sampling (*14*). He stated that the most important point in making use of statistical techniques in cruising was to have reliable estimates of the standard deviation. Robertson in 1927 also compared line plot and strip methods of cruising (*11*). He found the line plot method to be more accurate than the strip method. Candy in 1927 stressed the importance of calculating the accuracy of the estimate in any type of cruising work (*3*). He compared both strip and line plot methods and stated that the line plot method was the only one suitable for determining the adequacy of sampling.

Schumacher and Bull in 1932 recognized the utility of stratifying systematic sample plots by forest conditions in determining sampling error for the Forest Survey in bottomland hardwoods (12). Mudgett and Gevorkiantz in 1934 followed the same idea in estimating the reliability of forest surveys in Wisconsin (*9*). Goodspeed in 1934 carried out a study to compare further the relative desirability of line plot and strip cruising (*4*). He concluded that the two methods, if applied with equal precision, gave much the same results with approximately equal reliability. Preston in 1934 recommended carrying out statistical analyses of systematic line plot cruises (*10*). He suggested the mapping of timber stand classes separately prior to sampling. He stressed the importance of discarding the idea of a fixed percent cruise and replacing it with a cruise intensity necessary for the desired accuracy. Hasel in 1938 in his study of sampling errors in timber surveys stressed the heterogeneity of timber stands even though they appear homogeneous at first glance (*6*). Because of this heterogeneity he considered the size and shape of sample plots as important. He stressed the point that a valid estimate of sampling error is possible only when the sampling units are independently and randomly selected. He also brought out the point that systematic cruises give closer estimates of mean and total volume than do random cruises and are better adapted to map making. Barton and Stott in 1946 developed a series of graphic aids to help the timber cruiser of accuracy in determining the intensity of cruise required for a specified degree of accuracy and probability (*1*). Stott in 1949 studied new techniques and tally forms used in line plot cruising in an effort to cut down on the time required in cruising (*13*). He found that by using the new type cumulative tally sheet considerable savings in time per plot could be effected. Johnson in 1949 made a study of the size of sample and type of sampling unit for estimating timber-volumes in the Pacific Northwest (*8*). He emphasized the fact that the sample should neither be larger or smaller than necessary for the desired results in an effort to eliminate waste of time, money, and effort. Johnson and Hixon in 1952 studied the efficiency of various sizes and shapes of plots in cruising old growth Douglas-fir timber (*7*). They made a complete tally of a 40-acre tract by 1/40 acre units. They then drew samples from this total using different combinations of the basic units. The sampling error for each estimate was calculated. The most efficient kind of plot was then chosen as the one which gave the smallest sampling error for a given amount of work. Their work indicated a plot 1 and 3 chains provided the best compromise between variation and cruising time required for old-growth Douglas-fir timber.

In Germany in 1948, Bitterlich proposed a new approach to timber estimation which eliminated the necessity of establishing sample plot boundaries (*2*). Grosenbaugh in 1952 publicized this method in the United States (5). Briefly, this method consists of establishing a number of sampling points in the timber stand to be inventoried. The estimator then occupies each sam-

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pling point successively. He views the diameter of every tree visible from each point, counting the number of trees whose diameter appears larger than a hand held angle gauge. The total count of all trees divided by the number of sampling points multiplied by a constant will give an estimate of average basal area per acre. Other timber survey statistics can be developed by varying the procedure. This method needs further investigation to determine its practicability and the accuracy of the results obtainable with varying intensities of sampling in comparison to conventional plot and strip methods.

Procedure

This study was initiated to determine the reliability and efficiency of timber estimates made with the variable plot method of Bitterlich using various critical angles.

A 40-acre tract was laid out in a stand in southeastern New Hampshire consisting of an overstory component of scattered overmature white pine and hemlock and a younger understory component of hardwoods, principally, red maple, black birch and beech. The stand on the 40-acre tract varied considerably, ranging from localized portions having volumes as high as 50M board feet per acre to other portions supporting a neglible volume. The 40-acre tract was further subdivided into 4 ten-acre tracts.

One hundred estimating points were established at 2-chain intervals, 25 per 10-acre tract.

The 4 ten-acre tracts were then cruised by the variable plot method using three critical angles and their corresponding basal area factors as shown below:

Critical angle in minutes	Basal area factor
52.09	2.5
104.18	10.0
208.38	40.0

These three angles were used because they cover a wide range of possible choices, including the generally recommended 104.18′ angle.

It was found impossible to occupy each estimating point for the three individual cruises. This limitation was encountered because the same tree can be counted from more than one estimating point under certain conditions. This occurrence is a function of the size of critical angle used, the diameter of the tree, the tree's distance from the estimating point, and the interval between estimating points. The probability of a tree being seen from more than one point is increased when a small critical angle is used, if the trees are large, if the trees are close to the estimating point, and if the distance between estimating points is short. If the same tree were to occur in the count of two or more points, it would be incorrect to use these individual counts in developing a mean number of trees per point. Utilizing point counts of this type would be analagous to using the plot tallies of overlapping conventional cruise plots as if they were separate records. Any cruise results would be in error.

The only way to avoid this situation in the variable plot method is to be certain that a tree will not appear in more than one point tally. It is thus necessary to determine a minimum distance between estimating points. This minimum distance should be at least twice the maximum distance to the largest tree on the area that would cause it to be counted. This distance can be found:

$$D = \frac{r}{12 \tan \frac{a}{2}}$$

where:

r = radius of largest tree in inches
a = critical angle
D = maximum distance to largest tree in feet

The minimum distance between points should be $2D$.

This same precaution must be observed when establishing estimating points near tract boundaries. In the latter case however, the minimum distance need only be D.

The minimum distances between points for the three cruises were determined and are shown in Table 1.

Estimating points were chosen from the established points to give a spacing as close as possible to the minimum distances calculated. Even so, it was necessary to discard some of these points when it was found that a tree was counted more than once.

Under these limitations it was found that the number of points used varied according to the critical angle, as shown in Table 2.

The required estimating points were visited and a tally made of all trees over 6 inches d.b.h. by species and 2-inch diameter classes. As explained by Grosenbaugh all trees appearing larger than the critical angle were recorded (*4*). This was done for each gauge and a record was also kept of the time required to make each point tally.

A 100 percent tally was then made of each 10-acre tract to serve as a basis of comparison. All trees over 6 inches in diameter were tal-

Table 1.—Minimum Distance Between Estimating Points

Critical angle	Estimated diameter of largest tree	Approximate minimum distance between estimating points	
Minutes	*Inches*	*Feet*	*Chains*
52.09	36	396	6
104.18	36	198	3
208.38	36	138	2

Table 2.—Variation in Numbers of Points According to Critical Angle

Critical angle	Number of points used[1]				
	40 acres	10 acre tract A	10 acre tract B	10 acre tract C	10 acre tract D
Minutes					
52.09	9	2	2	2	2
104.18	78	19	19	18	22
208.38	100	25	25	25	25

[1]The individual estimating points taken in cruising the 10 acre tracts are not always the same as those used for the 40 acre tract because of spacing requirements.

TABLE 3.—BASAL AREA DETERMINATIONS FOR THE 100 PERCENT AND THE THREE CRITICAL ANGLES

Area cruised	52.09′ B.A. per acre	52.09′ Deviation from 100% tally	104.18′ B.A. per acre	104.18′ Deviation from 100% tally	208.38′ B.A. per acre	208.38′ Deviation from 100% tally	100% Tally B.A. per acre
	Sq. ft.	*Percent*	*Sq. ft.*	*Percent*	*Sq. ft.*	*Percent*	*Sq. ft*
40 acre tract	49.5	−47.8	74.3	−21.6	90.4	− 4.6	94.8
10 acre tract A	25.0	−63.9	49.5	−28.5	75.2	+ 8.7	69.2
10 acre tract B	47.5	−57.2	81.0	−27.0	96.0	−13.4	110.9
10 acre tract C	68.8	−26.7	81.1	−13.5	83.2	−11.3	93.8
10 acre tract D	53.8	−48.8	80.9	−23.1	107.2	+ 1.9	105.2

TABLE 4.—VOLUME DETERMINATION FOR THE 100 PERCENT TALLY AND THE THREE CRITICAL ANGLES

Area cruised	52.09′ Vol. per acre	52.09′ Deviation from 100% tally	104.18′ Vol. per acre	104.18′ Deviation from 100% tally	208.38′ Vol. per acre	208.38′ Deviation from 100 % tally	100% Tally volume per acre
	Bd. ft.	*Percent*	*Bd. ft.*	*Percent*	*Bd. ft.*	*Percent*	*Bd. ft.*
40 acre tract	8,314	−47.5	11,963	−24.5	14,633	− 7.6	15,843
10 acre tract A	5,654	−52.6	8,477	−28.9	13,234	+10.9	11,927
10 acre tract B	10,885	−48.1	15,559	−25.8	17,564	−16.2	20,964
10 acre tract C	11,032	−27.3	12,459	−24.1	13,843	−15.7	16,416
10 acre tract D	4,227	−69.9	10,551	−24.9	13,600	− 3.1	14,041

TABLE 5.—BASAL AREA SAMPLING ERRORS FOR THE THREE VARIABLE PLOT CRUISES

	52.09′ Estimating points used	52.09′ Sampling error[1]	104.18′ Estimating points used	104.18′ Sampling error[1]	208.38′ Estimating points used	208.38′ Sampling error[1]
	Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
40 acre tract	9	10.9	78	7.7	100	8.4
10 acre tract A	2	7.4	19	20.4	25	18.6
10 acre tract B	2	50.0	19	15.2	25	19.2
10 acre tract C	2	26.3	18	17.3	25	18.8
10 acre tract D	2	20.0	22	10.8	25	11.6

[1]Standard error of mean expressed as percent of mean basal area per acre.

lied by 2-inch diameter classes.

For the variable plot basal area determinations the total number of trees that occurred on the estimating points were tallied. These totals divided by the number of estimating points gave the mean number of trees per point. This mean number times the appropriate basal area factor gave an estimate of basal area per acre. The board foot volume estimates were then developed from these basal area figures. It was necessary to prepare a table showing board feet per square foot of basal area by species groups recognized and diameter class. Local volume tables were chosen for the study. The number of board feet in each diameter class was then divided by the basal area corresponding to that diameter to develop the required table. The individual ratio for each tree tallied at each sampling point was read from this table. The individual ratios were then totalled for all the points used and divided by the total tree count to arrive at a weighted average number of board feet per square foot of basal area. This average ratio times the basal area per acre then gave the board feet per acre estimate.

The total basal area and volume figures were obtained from the 100 percent tally using the same local volume table employed in the preparation of the board foot per square foot basal area table.

Results

The basal area and volume determinations are shown in Tables 3 and 4. A comparison of the basal area and volume estimates made with the three critical angles to the complete tally shows that the critical angle of 208.38′ consistently gave the closest results for the entire area and for the individual 10-acre tracts. The 104.18′ critical angle estimate gave less accurate results and the estimates with the 52.09′ angle were the most widely divergent.

Table 5 shows the basal area sampling errors for the three variable plot cruises. The validity of these figures may be considered somewhat questionable since the estimating points were laid out in a systematic pattern thus departing from a true random choice of points. However, they are included because many foresters do determine a sampling error for a systematic cruise. It should be observed that the sizes of the sampling errors do not necessarily agree with the overall accuracies of the cruises. The sampling errors rather show the amount of variability that can be expected in the per acre basal determination for the conditions under which the various estimates were made. These sampling errors show that approximately the same percentages of variation occurred for the 104.18′ and 208.38′ cruises. The percentages for the 52.09 cruise were much more variable which can in all probability be attributed to the appreciably smaller number of estimating points used.

Figure 1 shows the comparative lengths of time required to estimate different amounts of basal area per acre using the three critical angles. The comparisons are based only on the time required at an estimating point to determine the trees to be counted, and to make diameter estimates of these trees to the nearest 2-inch class with a Biltmore stick. Time spent in running lines between estimating points is excluded. A critical angle of 208.38′ allowed the fastest estimate to be made with an average of 1.5 minutes per point. Less than 2 minutes were required per point regardless of the basal area per acre. A critical angle of 104.18′

required a maximum time of 8 minutes per point with an overall av-average of 4.5 minutes. The time required per point with a critical angle of 52.09′ was considerably greater, ranging up to 20 minutes per point with an overall average of 11 minutes.

It should be noted that when using the 52.09′ angle none of the estimating points showed a basal area greater than about 100 square feet per acre. This is the result of not counting all trees which should be theoretically included. Using this angle a large tree should be counted even though it might be several chains distant. It is frequently impossible to see such a tree under field conditions because of intervening vegetation.

Table 6 shows the total length of time spent taking tally for the three critical angles. The shortest time was required using the 52.09′ angle because fewer estimating points could be used. However, in view of the inaccurate estimate of basal area and volume this time factor is of minor importance. The estimate with the 208.38′ angle required a little less than twice as long but the added accuracy of the estimates would seem to make it worthwhile. The maximum time was spent using the 104.18′ angle.

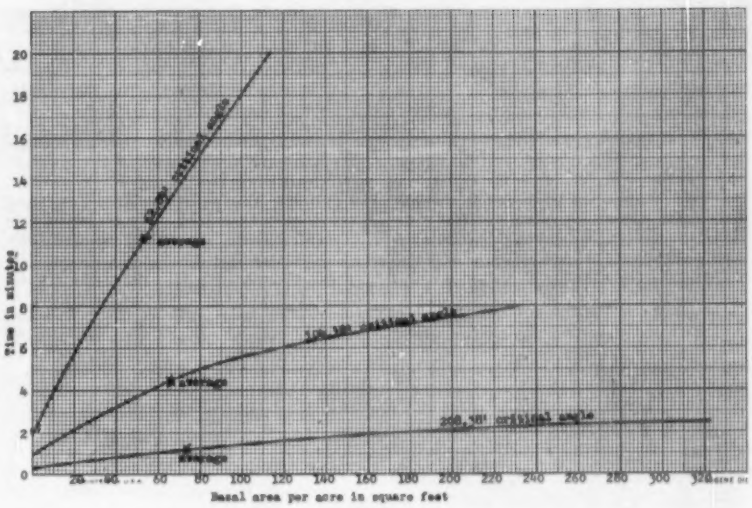

Fig. 1.—Required time to estimate basal area per acre per point with three critical angles.

Table 6.—Total Time Expended on Estimated Points for the Three Variable Plot Cruises

	52.09′			104.18′			208.38′		
	Estimating points used	Av. time per point	Total time	Estimating points used	Av. time per point	Total time	Estimating points used	Av. time per point	Total time
	Number	*Minutes*	*Minutes*	*Number*	*Minutes*	*Minutes*	*Number*	*Minutes*	*Minutes*
40 acre tract	9	11	99	78	4.5	351	100	1.5	150
10 acre tract A	2	11	22	19	4.5	85	25	1.5	37
10 acre tract B	2	11	22	19	4.5	85	25	1.5	37
10 acre tract C	2	11	22	18	4.5	81	25	1.5	37
10 acre tract D	2	11	22	22	4.5	99	25	1.5	37

Conclusions

From the standpoint of efficiency based on both accuracy and required time the 208.38 critical angle proved best in this study. The basal area determination for the 40 acres was only 4.6 percent low and board foot volume estimate was 7.6 percent low. There were slightly greater deviations for the individual 10-acre tracts. The results of the estimates with the 52.09′ critical angle were much more inaccurate. For the 40 acres the basal area determination was 47.8 percent low and the volume estimate was 47.5 percent low. Again somewhat greater deviations were found for the individual 10-acre tracts. Using this angle the number of estimating points that can be used on an area are limited. The estimates with the 104.18′ critical angle gave basal area and volume figures intermediate between those found for the other two angles. In addition it required the greatest length of time.

The fact that all the results of the 52.09′ and 104.18′ angle cruises were too low supports the conclusion that a systematic error was present. Theoretically there should have been no differences in the results of the three cruises since the mathematical relationship is constant regardless of the critical angle. However from a practical standpoint it would appear that the method of variable plot cruising works best with a wide critical angle used at the maximum number of estimating points. The explanation for this lies in the size of plot and attendant difficulty in making accurate tree counts. The smaller a plot the greater the chances for an accurate tree count. If a large critical angle is used the corresponding plot size for any given diameter tree is reduced. The likelihood of a tree being missed is thus minimized. Smaller critical angles increase the size of plot and correspondingly increase the chances of not counting all trees that theoretically should be counted. Some of these trees may be up to several chains distance from the estimating point. They are frequently obscured by other trees or dense low vegetation.

In all probability there is a maximum critical angle beyond which any increase will not result in a better tree count. Naturally this angle would vary for specific forest conditions. It is doubtful that an angle greater than 208.38′ would have given a better timber estimate in this study because

there were few occasions when a tree could have been missed because of its distance from an estimating point.

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SOCIETY OF AMERICAN FORESTERS

55TH ANNUAL MEETING

Portland, Oregon Multnomah Hotel

October 16-19, 1955

See pages 596-600 for information concerning the schedule of events, hotel reservations, and committees for the meeting.

Experiments in Killing Northern Hardwoods with Sodium Arsenite and Ammonium Sulfamate

John R. Curry and
F. M. Rushmore[1]

Adirondack forests contain large quantities of cull hardwoods that should be poisoned or girdled. This article reports on a comprehensive study of the quantities of sodium arsenite and ammate required to kill large beech, birch, and maple trees at two different seasons of the year. The chemicals were applied in solution through holes bored in the trees.

THROUGHOUT the Northeast the presence of cull and weed hardwoods is a common problem in forestry practice. Here the lumber industry originated, and for many decades softwood lumber was the main forest product. This era was followed by an increased production of softwood pulp, which continues to the present. Hardwood utilization developed rather slowly; hardwoods in mixed stands were often unmerchantable for a period of 100 years or more after the first softwood cut. Hardwood markets and utilization still lag behind comparable markets for softwoods. Under these conditions hardwoods of both good and poor species were favored in the stands, and they have become dominant on many forest sites.

Forest conditions in the Adirondack Mountains of New York State illustrate the general problem in this broad region. Lumbering of softwoods began in the early 1800's, and by 1870 the Adirondacks had been cut at least once for white pine and spruce saw logs. Softwood lumber production declined after 1870, but soon a strong demand arose for spruce and fir pulpwood, a demand which still continues. In the meantime few hardwoods were cut until about 1900, and then only on railroad-logging operations on limited tracts of accessible and nonmountainous land. With the development of truck logging about 1935, hardwoods on rough mountain land first became merchantable.

Most Adirondack forests were originally mixed stands of red spruce and some other conifers in mixture with northern hardwoods. The long period of cutting exclusively for softwoods led to important changes in these mixed stands. After two or more such cuttings, stands were often converted into forests where hardwoods, mainly overmature and often defective, were dominant.

The market for hardwoods in this section is largely confined, as yet, to high grade saw logs. Cutting for this market does not solve the problem of inferior trees because many dominant and understory trees are too poorly formed or defective to yield merchantable logs.

This problem of inferior hardwoods has long been a major concern of forest landowners and practicing foresters in the Adirondacks. In 1900 Fernow (*7*) described the problem and his attempts to develop markets for this low-grade material. Churchill (*3, 4*), recognized removal of defective hardwoods as essential in improving growth of conifers. Under his leadership, the practice of girdling defective hardwoods on certain mixed types was introduced on the lands of Finch Pruyn and Company, a practice which this company has consistently followed for 30 years. Recently House (*8*) in his survey of forest conditions in New York has rated the deterioration of hardwood types as the "most important single problem in the productivity of these forests." He calls the reduction of softwood stocking in the mixed spruce—fir—hardwood types "another serious problem" which "current cutting is accelerating and which is being checked only on limited areas."

Although girdling of defective and weed trees has been practiced for several decades by a few landowners, the total amount of commercial forest land so treated is small. All told, not more than 40,000 acres of a total of about 2,000,000 acres needing stand improvement have been so treated. When girdling costs $4 to $8 per acre, the investment is frequently more than is clearly justified. The search for techniques less expensive and more reliable than girdling has encouraged experimentation with chemicals.

Chemicals have so far had only a limited use in this section but appear to offer prospects of providing an economical method of control. Sodium arsenite (*6, 9*) has been recognized as a potent tree poison but one that can be hazardous to men and animals. In recent years ammate, (ammonium sulfamate) (*1, 12*) has been used successfully in the South to kill weed trees. The hormones 2,4-D and 2,4,5-T have been successfully used in killing small trees, but when used as a basal spray on large trees (one of the most effective treatments) they have so far proved to be too expensive (*2*).

Experiments were undertaken by the Adirondack Research Center of the Northeastern Forest Experiment Station to explore the possibilities of utilizing chemicals to find a practical solution to the problem of killing defective northern hardwoods. At the outset it was decided: (1) to work for a low-cost method that would promise economic advantages over girdling; (2) to test the chemicals that had been found to be most effective elsewhere; (3) to confine the experiments to injections of poison in small holes because this method permits accurate measurement and control of chemical applications, does not expose the chemical to wildlife, and appeared to offer a

[1]Research foresters of the Northeastern Forest Experiment Station, Forest Service, U. S. Dept. Agric., stationed at the Adirondack Research Center, Paul Smiths, N. Y., in cooperation with Paul Smith's College.

Since coauthoring this article Mr. Curry has accepted the position of general manager, Whitney Industries, Sabattis, N. Y.

TABLE 1.—NUMBER OF TREES TREATED IN EACH OF EIGHT SEASONAL TREATMENTS.

Species	Sodium arsenite in holes at intervals (in.) of—			Ammate in holes at intervals (in.) of—			Control trees:[1] holes at intervals (in.) of—			Total
	4	8	12	4	8	12	4	8	12	
Beech	2	2	2	2	2	2	1	1	1	15
Yellow birch	2	2	2	2	2	2	1	1	1	15
Hard maple	2	2	2	2	2	2	1	1	1	15
Total	6	6	6	6	6	6	3	3	3	45

[1]Control trees were bored, but no poison was injected. All holes bored were 7/16 inch in diameter and 4 inches deep; their capacity was 9 milliliters of poison solution.

promising technique of application; and (4) to concentrate first on tests of killing large cull trees because these trees represent the most common and difficult trees to be removed in improvement operations in this area.

The literature on chemical poisoning contained no experimental data on the amounts of poison required to kill northern hardwoods of large size. After a few preliminary tests showed variable results, presumably depending upon the species, the poison applied, and the season of application, plans were made to conduct a formal experiment to provide some of the information needed to design efficient control methods adapted to Adirondack species and conditions.

The Experiments

The first experiment[2] was planned to determine: (1) the amounts of sodium arsenite and ammate required to kill large cull trees; (2) the distribution of these chemicals necessary to produce successful killing; (3) the relative resistance of three species to both chemicals; and (4) the effectiveness of the chemicals at various seasons of the year.

Injected fluids rise rapidly to the crown of a tree, but horizontal distribution is limited. To treat large trees effectively, injections must be made at several points around the bole. Chemicals were injected in similar quantities at three different intervals measured on the circumferences of the test trees. Similar injection techniques have been used by Lexen (*10*), Pessin (*13*), and others.

The general distribution of treatments by species, chemicals, and intervals between injections, for each of eight seasonal treatments, is shown in Table 1.

The experimental trees were large culls of American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and hard maple (*Acer saccharum*). The terms beech, birch, or maple, when used hereafter without qualification, refer to these species only. The trees ranged from 9 to 28 inches d.b.h. (average 15 inches). Another abundant Adirondack hardwood, soft maple (*Acer rubrum*), was not included in these experiments because trees comparable in size and condition to the other trees tested were not commonly found either on the experimental area or in this section as a whole.

The first treatment was made on July 6, 1949, followed by similar treatments on August 2, August 26, September 30, October 21, November 17, 1949, and on January 20 and June 2, 1950. The first treatment, on July 6, was at the time when the trees were in full leaf and actively growing. August 2 corresponded to the latter part of the recognized growing season, hardwood bark ordinarily showing a tendency to "stick" about August 10 in this section. The August 22 treatment was made in the period of summer dormancy, during which the trees show little shoot or diameter growth, but are in full leaf and are apparently manufacturing and storing food. The September 30 treatment was made after the "turning" of the leaves but before leaf-fall. The October 21 treatment was made after the leaves fell. The November 17 treatment was an early winter treatment, and the one on January 20 was a midwinter treatment. A treatment planned for early spring (March 1950) could not be made because of high sap pressure in the maple and birch. The June 2, 1950, treatment was made soon after the new leaves appeared and before they were fully developed.

A portable gasoline-powered boring machine was used in preparing the injection holes. "Bobbin" bits were found to be more satisfactory than conventional bits and were used throughout these experiments. All holes were 7/16 inch in diameter and were bored 4 inches deep into the sapwood; they were spaced either 4, 8, or 12 inches apart around the tree and about 30 inches above the ground.

Fifty-percent solutions of both ammate and sodium arsenite were used throughout these experiments. Solutions were made by mixing equal weights of water and ordinary dry commercial grades of the chemicals. All of the ammate dissolved, but part of the sodium arsenite remained undissolved as a sludge in the containers. Each hole received about 9 milliliters of solution; in terms of dry weight, each injection of ammate contained approximately 5.6 grams of chemical, and each injection of sodium arsenite 6.9 grams.

Results

The effects of treatment were judged by estimating the percentage of dead crowns on the trees. Estimates were made in June of three successive years following treatment, 1950, 1951, and 1952. Trees with 90 percent or more of their crowns dead were grouped with the trees that were entirely dead. These represented less than 15 percent of all trees classed as dead.

Season of treatment had a strong influence on results. Results of the four treatments made during the summer months were similar. There were also similarities among the results of the treatments made in the fall and winter months. But

[2]The authors acknowledge the assistance of E. J. Fenchak, who made important contributions to the development of the experimental techniques and took part in carrying out the experiments.

there were essential differences between the results of the summer treatments and the fall and winter treatments.

In this analysis no attempt has been made to define the relative results of the various treatments applied either within the summer period or within the fall and winter period. Such differences as were apparent within these broad seasons could not be ascribed to differences in treatment dates. Results are summarized in Table 2. Detailed records on the results of individual treatments are available and will be supplied by the authors on request.

Summer treatments. — Sodium arsenite was almost uniformly successful in the summer treatments, on all species and at all three rates of injection (Table 2). Of a total of 72 trees treated with this chemical in the summers of 1949-50, all but 5 were dead by June 1952. Three of the living trees were beech and two were maple; all treated birch had died.

At the lowest rate of injection (12-inch interval between holes), all but 3 of 24 trees treated with sodium arsenite died. These results indicate that smaller quantities of chemicals than any tested, at least at the 4- and 8-inch intervals, might be successful as summer treatments. These results led to a supplementary summer experiment designed to measure chemical toxicity more exactly. The preliminary results of this study will be discussed later.

Summer treatments with ammate were less successful at all rates of injection than were comparable sodium arsenite treatments. Of a total of 70 trees treated with ammate, 27 had died and 43 were living in June 1952. Maple showed great resistance to ammate: only 2 of 24 trees treated had died. Results were much better on both birch and beech, and at the 4-inch injection interval the killing of both these species was quite satisfactory. The ammate injections spaced farther apart gave generally unsatisfactory results.

Fall and winter treatments.—In practically all cases, fall and winter injections resulted in less defoliation than the same treatments applied in the summer months. Species differences are conspicuous in the results (Table 2). Beech showed highest mortality, while only a few maples were killed; results with birch were intermediate. These differences in species response may be attributed largely, in our opinion, to the sap pressure developed by maple and birch during warm days in late fall, winter, and spring. Such pressures probably result in flushing of the injection holes and loss of chemicals.

Sodium arsenite was ineffective in killing maple at all injection rates during these seasons. With beech and yellow birch, arsenite injections at the 4-inch interval were quite successful, but injections at the 8- and the 12-inch intervals gave unsatisfactory results.

Ammate gave unsatisfactory results on both maple and birch during these seasons. On beech, however, results were in general considerably better—although somewhat erratic. The over-all results on beech during this period compared favorably with the summer treatments with the same chemical, and with the winter treatments with sodium arsenite. The use of ammate on beech as a fall and winter treatment deserves more detailed study to explain some of the inconsistencies in these data and to define more closely this chemical's effectiveness on this species.

Additional summer treatments. —The supplementary study referred to previously was begun on

TABLE 2.—KILLING AND DEFOLIATION OF TREATED TREES IN JUNE 1952[1]
(Trees treated July 1949-June 1950)

Species, and intervals between holes (inches)	Sodium arsenite			Ammate			Control trees[2]		
	Trees treated	Trees dead	Average defoliation	Trees treated	Trees dead	Average defoliation	Trees bored	Trees dead	Average defoliation
	No.	*No.*	*Percent*	*No.*	*No.*	*Percent*	*No.*	*No.*	*Percent*
SUMMARY OF FOUR SUMMER TREATMENTS									
Beech 4	8	8	100	7	7	100	3	0	7
8	8	7	94	8	5	86	4	0	2
12	8	6	86	7	1	34	4	0	1
Yellow birch 4	8	8	100	8	6	89	4	0	4
8	8	8	100	8	4	52	4	0	5
12	8	8	99	8	2	39	4	0	5
Hard maple 4	8	8	100	8	2	61	4	0	[3]22
8	8	7	96	8	0	36	4	0	5
12	8	7	94	8	0	17	3	0	5
SUMMARY OF FOUR FALL AND WINTER TREATMENTS									
Beech 4	8	8	100	8	6	90	4	0	11
8	8	2	59	8	4	59	4	0	11
12	8	1	42	8	6	79	4	0	4
Yellow birch 4	8	7	90	8	2	29	4	0	4
8	8	4	68	7	0	14	4	0	4
12	7	0	24	9	0	7	4	0	6
Hard maple 4	7	1	38	7	0	14	4	0	6
8	8	0	14	8	0	14	4	0	1
12	8	1	24	8	0	8	4	0	4

[1]Trees with crown defoliation of 90 percent or more were considered dead.
[2]Control trees were bored, but no poison was injected. In the treated trees the holes held about 9 milliliters of poison solution.
[3]The crown of one control tree was defoliated 80 percent.

TABLE 3.—ESTIMATED DEFOLIATION OF TREATED[1] TREES, BY POISON DOSAGE, JUNE 1952
(Trees treated in July 1951)

Species	Sodium arsenite (Milliliters of solution per hole)				Ammate (Milliliters of solution per hole)			
	2	4	10	14	8	16	24	32
	Percent							
Beech	95	80	98	100	5	100	98	98
(3 trees)	50	80	100	100	70	80	100	95
	30	90	95	100	100	75	98	60
Average	58	83	98	100	58	85	99	84
Yellow birch	95	100	98	100	100	60	98	98
(3 trees)	100	95	100	85	95	10	100	100
	100	90	100	100	20	95	100	85
Average	98	95	99	95	72	55	99	94
Hard maple	95	100	100	100	10	70	75	15
(3 trees)	40	90	100	100	20	60	98	100
	95	75	100	100	20	85	60	90
Average	77	88	100	100	17	72	78	68

[1]50-percent solution injected in holes bored 2 inches deep, spaced 8 inches apart.

July 11-12, 1951, to test the toxicity of both sodium arsenite and ammate at a wider range of injection rates than those tested in the main experiment.

Four rates of injection were tested for each chemical, applied as 50-percent solutions. For sodium arsenite these were either 2, 4, 10, or 14 milliliters per hole, with all holes at 8-inch intervals. Because some trees had not been seriously affected by previous injections of ammate, injections of this chemical were either 8, 16, 24, or 32 milliliters, also in holes at 8-inch intervals. All holes were 2 inches deep and 7/16 inch in diameter.

When more than 4 milliliters of solution were applied, it was necessary to make repeated injections until the required quantity was absorbed. In general, the holes could be refilled every 5 minutes on a clear warm day; but earlier attempts to use this technique during cool cloudy weather were abandoned because the rate of absorption was much slower. Quantities injected into each hole were measured with a graduated syringe.

The same species were tested as previously: beech, yellow birch, and hard maple. Each treatment was replicated three times for each species.

Results of these treatments, based on an examination made in June 1952, 11 months after treatment, are shown in Table 3. Additional defoliation and mortality can be expected on these trees. Therefore, these results are not strictly comparable to those in Table 2, where periods of 24-36 months elapsed between treatment and examination.

This experiment showed that relatively small quantities of sodium arsenite applied during the growing season will cause severe defoliation and death of large cull trees. The smallest injection (2 milliliters at 8-inch intervals) caused 90 percent or more defoliation of six trees out of nine treated, after 11 months. The trees not immediately killed were two beech and one maple. One of these three was expected to die within 2 years, the others to retain portions of their crowns for a longer time.

Results obtained with 4-milliliter injections of sodium arsenite solution appear to be quite satisfactory. Death within 2 years can be anticipated for all trees treated. Results within this range should be considered satisfactory in all cull-tree operations.

From these data it appears that 4 milliliters of sodium arsenite solution injected at 8-inch intervals during the summer will give entirely satisfactory killing, and that injections of less chemical (3 milliliters at 8-inch intervals) may give acceptable results.

Although much heavier injections of ammate were used, the results with this chemical were not so satisfactory as the lighter injections of sodium arsenite. A better comparison of relative effects of the two chemicals can be expected, however, in subsequent examinations.

The higher resistance of maple to ammate injections, observed in the main experiment, is confirmed by these data.

From these data it would appear that ammate injections must be made in relatively large amounts to produce results comparable to those obtained with sodium arsenite. For the practical objective of these studies—the development of a low-cost, rapid method—ammate appears to be definitely inferior to sodium arsenite.

This supplementary study has resulted in fairly satisfactory definition of the main objectives. The minimum amount of 50-percent sodium arsenite solution required to kill cull trees in summer is in the range of 2-4 milliliters per 8-inch interval of circumference. For ammate, the minimum quantities are considerably larger: approximately 8-16 milliliters per 8-inch interval for beech and yellow birch, and about 12-20 milliliters for hard maple.

Other Results

In addition to information on the main objectives, these studies have produced leads and information on several other aspects of the use of chemicals in treating trees.

Effects on other species.—Experience in routine improvement and other experiments, not described in this report, show that other common Adirondack species may be treated successfully with sodium arsenite. No difficulty has been experienced in killing the following species with this chemical: soft maple, white ash, American elm, red spruce, and balsam fir. From this experience, the writers are at present assuming that these and other Adirondack trees will be killed as readily as the species tested, although further experience may show exceptions.

Tree size.—Does the size of a tree influence the effectiveness of these injections made at intervals

around the circumference? An answer to this question was sought in the available data, but within the size range of 9-28 inches d.b.h. of the test trees no difference related to size could be detected.

Basal sprouting.—Basal sprouting was not appreciably affected by the treatments. Trees of the species and sizes treated, because of age and low vigor, are not naturally heavy sprouters. A small proportion (11 percent) of the check trees showed basal sprouts at the last examination, in June 1952. A smaller proportion of the trees killed by chemicals had sprouts (7 percent). Among the treated trees still alive, 17 percent had basal sprouts. None of the basal sprouts were more than 4 feet high. Sprouts were most frequent on maple and beech. Birch sprouted only rarely.

Debarking.—The bark loosens readily in the areas in line with the injection holes. Here it is first killed by the chemical, but on the intervening strips it ordinarily remains firmly attached for a period of several months after treatment. Within 1 year after death the bark of deadened trees may usually be removed easily. At the June 1952 examination all but 8 of 136 dead trees had loosened bark. Seven of those having tight bark were birch, one was a hard maple. Beech are the first to lose their bark, followed by maple. The bark of birch is relatively slow to loosen.

Insects and disease.—All dead trees and the dead wood of all partially killed trees became infested with Ambrosia beetles (*Xyloterinus* spp.) prior to the 1952 examination. Although no specific study of decay has been made, trees treated and killed in 1950 appear to be deteriorating rapidly. Several have lost large limbs through breakage and decay during 1952 and 1953.

Rate of dying.—Beech and birch that are severely injured, but not killed, by chemical treatments soon die. Maple similarly affected persist longer. Of a total of 20 beech and birch showing 60-90 percent crown damage in June 1950, only one was classed as living 1 year later. Maple having the same degree of defoliation showed much less mortality during this same period.

Trees with less than 50 percent of the crown dead at the end of the first year will succumb only slowly, if at all, to the secondary effects of the treatment. On the other hand, there is little evidence of crown recovery; trees with 30 percent or less initial loss of crown showed no evidence of recovery over the 2-year period covered by these observations.

Practical Application

Research is continuing in the use of poisons to deaden unwanted trees; and the methods used in these preliminary studies will doubtless be improved and refined. Meanwhile, for putting chemicals to practical use in deadening weed trees, the following preliminary recommendations are offered.

The cost of injecting chemicals by these methods will depend primarily upon the minimum dosages used; these will in turn determine the size and number of the injection holes. Poison applications tend to follow the principle of diminishing returns. Where light injections may cause heavy defoliation and fairly high mortality, two or three times these amounts would often be required to produce full mortality immediately.

Before any efficient technique of application can be developed, a decision must be reached on the degree of kill required to obtain a satisfactory treatment. Although objectives and standards will vary somewhat in stand-improvement operations, foresters are not usually interested in the complete and immediate killing of all trees. Indeed, a slow removal of overhead competition may frequently be an advantage in these operations.

Under Adirondack conditions, 75-80 percent defoliation 12 months after treatment, followed by defoliation of 85-90 percent at the end of the second year, would ordinarily be considered satisfactory. This degree of defoliation and death can apparently be anticipated in the summer sodium arsenite injections of 4 milliliters at 8-inch intervals, as shown in Table 3. Accordingly, this has been accepted as satisfactory, and methods of application are currently being developed for this treatment.

Five milliliters (one teaspoonful) of solution can be injected into a hole 7/16 inch in diameter and 2 inches in depth. A hole of this size, or somewhat smaller, can be readily made in a tree by one of several methods. Boring is slow and time-consuming and would be inefficient. A punch welded to the poll of an axe, as described by Pessin (*13*) will provide a satisfactory injection hole. A similar tool developed in the Pacific Northwest to obtain increment cores has also been found effective, although the capacity of the holes is less than that obtained with the axe Pessin (*13*) described.

All of the tools mentioned have one common disadvantage; two hands are required to produce results. A similar tool that could be swung with one hand would have an obvious advantage in that the chemical could then be applied without loss of time in laying down and picking up tools. The writers have built a tool on the principle of the Swedish increment punch, but of greater capacity and weight. Improvements in design are planned to provide a greater hole capacity and easier manipulation. Another device of promise being tested is a hammer with a short point attached.

The injection of poisonous chemical solutions should be made from a closed container with a valve to insure close control of the flow. A locomotive oiler of 1-quart capacity has been used successfully in this work. A backpack tank of 1½-2 gallons capacity with a spring-controlled nozzle would appear to be well adapted to injection of poisons. Use of such an outfit would remove the need for frequent refilling of the poison container from some central supply.

Safety

Persons who have written about the use of sodium arsenite and other arsenical compounds in agri-

culture and forestry generally emphasize the hazards to human life (*9, 13*), livestock, and wildlife. The safety problems involved in the use of sodium arsenite should receive the careful attention of all those who plan to use this chemical.

The following warning is found on the label of one manufacturer's sodium arsenite container:

> Sodium arsenite is very poisonous and extreme care must be taken to keep it away from people and animals. Avoid getting in the eyes, nose and mouth or on skin and clothing. Wash thoroughly. Wash contaminated clothing with hot water and soap before re-use. Do not breathe dust or spray mist. Keep livestock off treated areas. Do not store with foodstuffs.

Ammate is not rated as poisonous to animals, but concentrated solutions may cause injuries to the skin. The following is quoted from the manufacturer's instructions: "Avoid prolonged contact of skin with concentrated solutions of ammate. In case of contact wash off promptly with plenty of water."

While no report of serious results to man from the use of sodium arsenite has been found in the forestry literature, reports and experience do show that loss of wildlife and livestock has occurred (*5, 9*).

One advantage of small injection holes in the application of sodium arsenite is the relatively low risk to animal life. With rapid summer absorption, there should be little or no opportunity for animals to obtain appreciable quantities of the chemical. Such careless practices as permitting the solution to overflow from injection holes or spilling it on the ground will, however, result in serious hazards.

Sludge accumulations in sodium arsenite containers and applicators have also been a common source of trouble. Such sludge forms naturally in water solutions made from commercial sodium arsenite powder. Sludge must be disposed of regularly and, where it is carelessly dumped on the ground, cattle and possibly other animals may consume it with fatal results. All such wastes and residues of sodium arsenite should be buried in disposal pits to prevent animal poisoning.

Arsenicals are commonly used in agriculture to control insects and other pests. Many household chemicals, such as lye, are toxic if taken internally. Experience has shown that, while the hazard of such chemicals cannot be eliminated, they can be used in routine farm and home management without undue risks to humans and animals, if the risks are fully recognized and adequate safety precautions observed. Sodium arsenite in forestry operations stands in a similar position to these farm and home chemicals. It should be used only under careful supervision and control, and with provisions for emergency action if the chemical is accidentally misused.

In this report of experimental results, no attempt will be made to give instructions on the detailed safety practices that should be followed in application. However, the writers have prepared such instructions for the guidance of men employed under their direction on routine treatments. Copies of these instructions, based on both the recommendations in the literature and the experience of the writers, will be supplied upon request.

Summary

Experiments were made to test the use of sodium arsenite and ammate (ammonium sulfamate) for killing large cull hardwood trees on Adirondack forest lands. Beech, birch, and maple trees were injected with 50-percent solutions of these chemicals in bored holes of 9 milliliter capacity. The holes were bored at three different intervals (4, 8, and 12 inches) around the tree circumference, and about 3 feet above the ground. Eight treatments were made at various seasons of the year.

Sodium arsenite proved to be generally more effective than ammate. Treatments in summer months, when the trees were in full leaf, were more effective than treatments made during the fall and winter months.

A supplementary study to determine minimum effective dosage showed that 4 milliliters of sodium arsenite injected in holes spaced 8 inches apart brought about satisfactory mortality. Further study is needed to determine the best interval between holes and the minimum effective dosage.

In using the poisons, safety precautions must be taken to avoid harm to humans, livestock, and wildlife.

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Notes

Pulpwood "Economy" Versus Multiple Products for Southern Pine

FIG. 1.—Effect of thinning on diameter growth of loblolly pine, North Louisiana, 43 years old. Site class 93.
Left, thinned at 26 and 31 years of age. Average d.b.h., 15 inches.
Middle, not thinned. Average of largest trees, number equal to unthinned plot. Average d.b.h., 11 inches.
Right, not thinned. Average of all trees. Average d.b.h., 7 inches.

TABLE 1.—COMPARISON OF PLOT 1, TO BE THINNED, AND PLOT 2, CHECK. AT 26 YEARS OF AGE. SITE CLASS 93. PER ACRE

Plots	Basal area 4" and over	Int. ¼" rule	Total	Merch.	Rough cords	Number of trees 4" and over
	Sq. ft.	*Bd. ft.*	*Cu. ft.*	*Cu. ft.*		
1	161.02	9,008	3,495	3,036	38.12	552
2	162.00	10,028	3,530	3,121	38.34	624

TABLE 2.—EFFECT OF THINNING ON VOLUMES, LOBLOLLY PINE—TOTAL YIELDS AT 43 YEARS

	Basal area sq. ft.	Bd. ft. Int. ¼"	Cubic ft. peeled	Cubic ft. merchant.	Cords with bark
Plot 1, thinned	246	33 M	6,942	6,479	80.1
Plot 2, check	179	26.2M	5,638	5,088	62.8
Gain by thinning	67	6.8M	1,304	1,391	17.3
Gain in percent	37	26	23	27	27

At Urania, Louisiana, the Yale School of Forestry established two sample plots in 1935[1] in an old field loblolly pine stand, each of one-eighth acre, for the purpose of determining the effect of thinning on the growth and yield of this species, and the relative profitableness of growing pine solely for pulpwood, versus the plan of producing saw logs of quality, with pulpwood as thinnings. These adjoining plots, then 26 years old, were closely comparable as to site, number of trees, basal area, cubic and board feet volume, and rough cords, at that time; the combined area being one-fourth acre. Larger areas would have shown greater deviations.

Plot 1 was thinned in 1935 at 26 years of age; in 1940 at 31 years; and in 1952 at 43 years. Plot 2 was held as a check plot.

The comparative yields of these two plots were measured at the age of 43 years in board feet International ¼ inch rule, in trees 6 inches and over d.b.h.; cubic feet peeled, total and merchantable, in trees 4 inches and over, to 3 inch top i.b.; and rough cords (with bark). Basal areas were recorded.

The yields of plot 1 include the thinnings.

The comparative yields at this age are shown in Table 2.

Mortality on the check plot, among the smaller trees, some of which, on the thinned plot, made pulpwood, accounts for the greater excess of basal area recorded on plot 1. The remaining comparisons are remarkably uniform.

Comparison of total yields produced up to 43 years does not give an accurate picture of the relative profits from a "pulpwood" economy versus "integrated use." To give a rough check on the advantage obtained by early thinning, comparisons are shown using a uniform $5.00 stumpage value per rough cord for pulpwood.

In comparing the values of the yields of lumber, an appraisal was made by Glenn F. Tannehill, forester for the Urania Lumber Company, as to the relative stumpage values of the logs on the thinned plot 1 and those on the check plot 2. His values were $40 per M for the former and $30 per M for the latter. In making the comparison, however, the figure $30 is used for the two thinnings made on plot 1,

[1]Eighteen plots altogether were established in loblolly pine and 10 plots in longleaf pine.

TABLE 3.—EFFECT OF THINNING ON VALUE OF CORDWOOD YIELDS, LOBLOLLY PINE

Plots	Age years	Cords	Value at $5.00	Period to 43 yrs.	Multiple at 5 percent	Value at 43 yrs.
1	26	18.72	93.65	17 yrs.	2.292	$214.65
	31	12.58	62.90	12 yrs.	1.796	112.96
	43	48.77	243.85	.....	.....	243.85
					Total	$571.46
2	43	62.83	.....	.....	.....	314.15
					Gain, percent	81.9

TABLE 4.—EFFECT OF THINNING ON VALUE OF YIELDS OF LUMBER—LOBLOLLY PINE

Plot	Age yrs.	Bd. ft. Int. ¼"	Stumpage value per M	Total stumpage value	Years to compound	Multiple at 5 percent	Value at 43 yrs.
1	26	3,864	$30.00	$115.92	17	2.292	$265.69
	31	4,880	30.00	146.40	12	1.796	262.91
	43	24,254	40.00	970.16	....	.....	970.16
							$1,498.76
2	43	26,216	$30.00	$786.48	....	.....	786.48
						Gain, percent	91.0

as the sizes of these logs, (since the trees removed were the smaller ones) are comparable with the average size on the check plot.

The first of these comparisons, in Table 3 indicates simply that by making two or more early thinnings for merchantable pulpwood, total yield in value may be increased by more than 80 percent as compared with one clear cutting at 43 years.

The second comparison, based on applying the board feet unit to these same thinnings, indicates a gain of over 90 percent.

A third comparison must now be made by contrasting the profitableness of a pulpwood "economy" with that of growing lumber as the final product. This works out as follows:

Value for lumber only	$1,498.76
Value for pulpwood only	571.46
Gain for lumber	$ 927.30
Gain, percent	162

or two and one half times the profitableness of growing pulpwood only. This ratio represents the relative economic value to society of a "multiple product" economy versus one managed for a single product, namely pulpwood. Had a portion of the yield been computed in poles and piling, the margin in favor of multiple products would have been greater, since these products command stumpage prices higher than lumber or pulpwood.

It is also obvious that this comparison is based on a stumpage value for pulpwood which may be considerably lower at $5.00 than the margin that might be paid to growers of timber and that with an increase in price for pulpwood stumpage, the advantage of growing saw timber would become relatively less.

The data shown in this comparison are, it is true, obtained from only two small plots and do not furnish a basis for Latin Squares or other statistical comparisons. But they do constitute a true and valid contrast, under strictly comparable conditions, for plots otherwise almost identical in quality, and are submitted as valid evidence bearing on the disputed questions of:

1. Whether thinned stands produce greater yields than unthinned stands.
2. Whether a pulpwood "economy" is the proper policy,
   a. for national forests in Texas and elsewhere;
   b. for private owners;
      (1) of paper mills
      (2) of small woodlots.

H. H. CHAPMAN
School of Forestry,
Yale University

(*Notes are continued on page* 587)

More About Wedge-Prisms

Subsequent to the appearance of *"A New Way to Look at Trees,"* in the March 1955 issue of the JOURNAL OF FORESTRY (53:163-167) the author's attention was called to two previous publications dealing with the use of wedge-prisms as angle-gauges in point-sampling. They are:

Müller, G. 1953. Das baumzählrohr. *Allgemeine Forstzeitung* 64 (19/20): 249-251. This article describes use of a wedge-prism mounted in a tube for basal area estimates, for measuring distances, and for estimating upper diameters.

Cromer, D. A. N. 1954. "Techniques and instruments for the determination of basal area and volume per year." *Australian Forestry* 18(2): 86-92. This article mentions Müller's wedge-prism device and describes an improvement consisting of wedges mounted in front of upper halves of the objective lenses of Dutch field glasses.

Neither of these articles mentions slope-compensation by rotation of the prisms around the line of sight, the use of two prisms to make an adjustable prism, or the use of decentered lenses in angle gauges for point-sampling.

DAVID BRUCE
Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture

Guide Map to Locations of Interest to Foresters in the West Coast States

(See Map on Following Pages)

British Columbia

1. **Vancouver.** University of British Columbia, Department of Forestry.
2. **Green Timbers.** Nursery and Ranger School. Turn east at junction of U. S. 99 and King George Highway.
3. **Haney.** University of British Columbia Forest. Field training of forestry students.
4. **Victoria.** Headquarters, British Columbia Forest Service, Department of Lands and Forests, Parliament Building.

California

1. **Happy Camp Working Circle Klamath National Forest.** Unit area harvest cutting—Douglas-fir.
2. **Klamath.** Simpson Redwood Co.'s truck road development.
3. **Big Lagoon.** Hammond Lumber Co. Logging camp, salvage mill, truck road development, selective logging, leaving redwood trees 6 ft. dbh and less. Bear damage in young-growth stands.
4. **Eureka-Arcata-Fortuna.** Industrial center, redwood sawmills and plywood plants; Arcata community forest of young-growth redwood; restocked redwood cutover lands at Freshwater; California Division of Forestry ranger headquarters.
5. **Van Duzen River.** Hammond Lumber Co., redwood logging and tree farm.
6. **Scotia.** Pacific Lumber Co., redwood sawmill and remanufacturing plant. Best example of complete utilization in redwood region.

   South edge of town along highway. Five acres of dense young-growth showing typical redwood sprout development. Natural grass has practically suppressed interplantings of the middle 1920's.

   Jordan Creek, Pacific Lumber Co., selective redwood logging with tractors and cable equipment.
7. **Dyerville.** Rockefeller Redwood State Park (Bull Creek Flat) virgin stand of very large redwoods. Founders Tree, world's tallest.
8. **Salmon-Trinity Alps.** National forest wilderness area.
9. **Ball Mountain.** Klamath National Forest. Unit area timber cutting, pure fir type.
10. **Marble Mountain.** National forest wilderness area.
11. **Mt. Shasta Brushfield Plantations.** Cleared strips in long-established brushfields on national forest.
12. **McCloud Nursery** (USFS), 4 MM per year.
13. **Pilgrim Creek Plantations.** Early day nursery.
14. **Lookout Point.** Sugar pine management under Blister Rust Control. Pruning of infected trees.
15. **Lower Klamath Lake.** National Wildlife Refuge: waterfowl.
16. **Sugar Hill Plantations.** Well-established stands on burned-over areas.
17. **Dunsmuir.** Ralph L. Smith Lumber Co's Castle Crag tree farm.
18. **Shasta Lake.** Many types of national forest recreation management, including concessions.
19. **Redding.** Shasta Forests Co.'s timberland under management. Permanent sample plot system, own no manufacturing facilities but probably have largest individual timber cut in state. Headquarters, Northern District of California Division of Forestry. U. S. Plywood plant at Anderson.
20. **Latour State Forests.** Selective logging in old-growth mixed-conifer type; Christmas-tree harvesting.
21. **Hat Creek.** Forest Insect Laboratory Field Station.
22. **Blacks Mountain Forest** (California Forest & Range Expt. Sta.). Methods of cutting pine, including insect risk, logging done by Forest Service. (Harvey Valley Grazing Allotment—practical application of Burgess Springs range research results.)
23. **Mt. Lassen.** Lassen Volcanic National Park.
24. **Chester.** Collins Pine Lumber Co., selective sanitation logging, permanent sample plots. Modern mill.
25. **Almanor Inn.** USFS integrated timber management. Ranger-designed and administered, brush clearing and planting, thinning and sugar pine establishment.
26. **Lyman Springs.** Diamond Match Co. mill, selective logging along Hwy. 36.
27. **Sterling City and vicinity.** Diamond Match Co. mill and selective logging; and old cutover restocking. Soda Springs—treatment of area for sugar pine management.
28. **Magalia.** California Division of Forestry pine nursery and Honor Work Camp, California Department of Correction.
29. **Quincy.** Feather River Experimental Forest (California Forest and Range Expt. Sta.). Experimental plantation of ponderosa pine and Jeffrey pine; thinnings, and field testing of hybrid pines.
30. **Paskenta.** Crane Mills, Coast Range Pine. Sustained yield operation. Joint private and Forest Service access road.
31. **Sacramento.** Wildlife Refuge. Waterfowl wintering area.
32. **Fort Bragg.** Jackson State Forest. Selective cutting of old-growth redwood-fir stand. Forestry work camp and branch nursery.

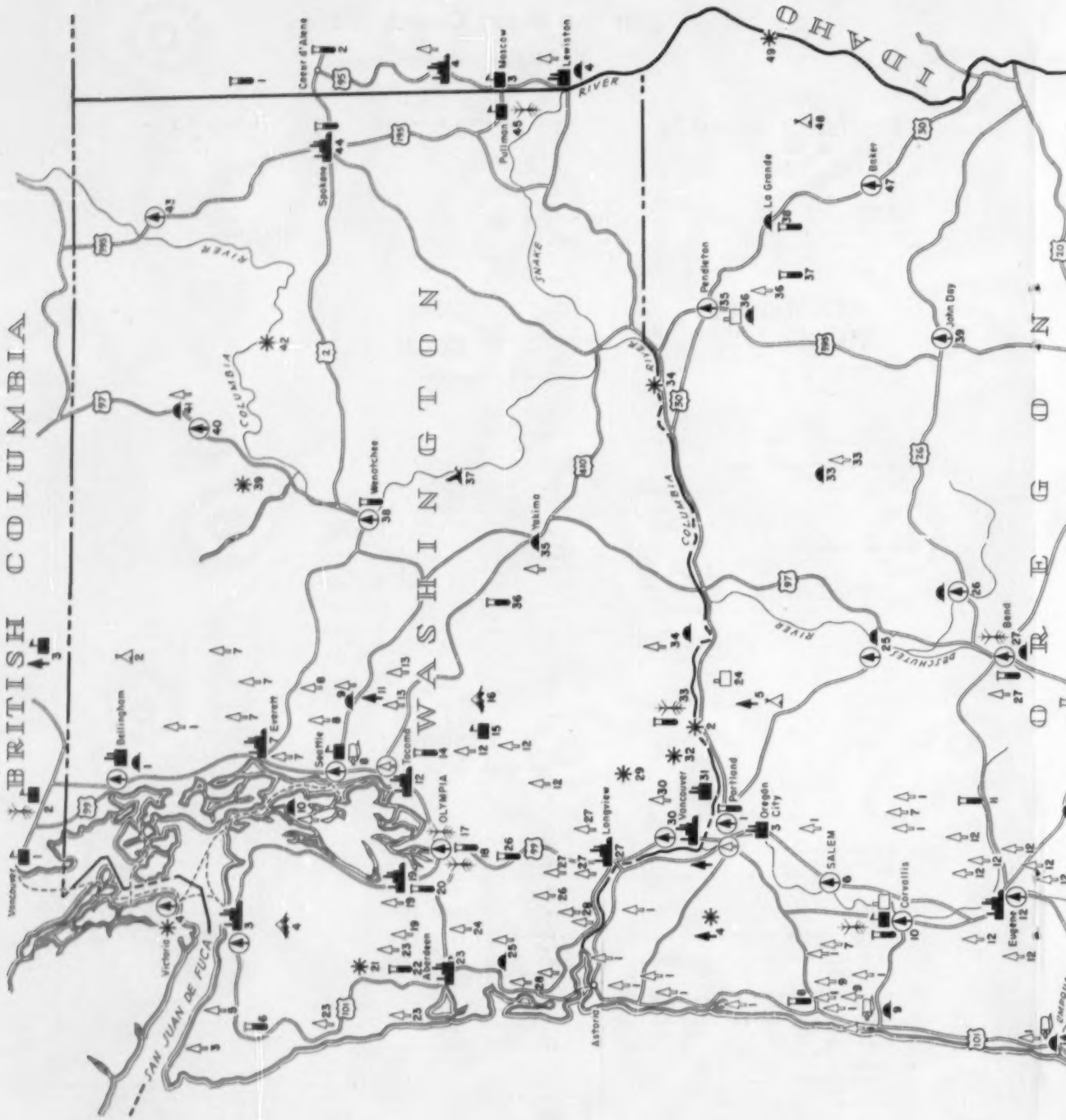
    Union Lumber Co. large redwood mill, hydraulic barker, chemical division, integrated utilization.

Idaho

1. **Priest River.** Priest River Experimental Forest (Intermountain Forest and Range Expt. Sta.). Fire research; test of strains of ponderosa and white pines, Douglas-fir and larch.
2. **Coeur d'Alene.** Deception Creek Experimental Forest (Intermountain Forest and Range Expt. Sta.). Methods of management and harvest of western white pine; Forest Insect Laboratory.
3. **Moscow.** School of Forestry, University of Idaho.
4. **Lewiston.** Headquarters, Potlatch Forests, Inc. sawmill and pulp plant. Other sawmills at Coeur d'Alene, Kamiah, and Potlatch. Tree farms.

Oregon

1. **Portland.** Headquarters, USFS, Pacific Northwest Region; Regional Administrator Bureau of Land Management; area office Bureau of Indian Affairs; State office Soil Conservation Service; office Fish & Wildlife Service; Pacific Northwest Forest & Range Expt. Sta.; West Coast Lumbermen's Assn.; Western Pine Assn.; Industrial Forestry Assn.; Mt. Hood National Forest; City and county forest. Site of Forestry Building, Lewis & Clark Exposition, 1905. Crown-Zellerbach Corporation tree farms.
2. **Bonneville Dam.** Power dam on Columbia River.
3. **Oregon City-West Linn.** Sites of two large pulp mills.
4. **Tillamook Burn.** Catastrophic forest fire of 1933 and reburns—354,000 acres, 11 billion bd. ft. Long-term salvage operations and State of Oregon rehabilitation project: aerial seeding, plantations, fire corridors.
5. **Mt. Hood.** Snow-capped mountain, 11,253 feet, year-long mountain recreation. Timberline Lodge.
6. **Salem.** Headquarters, Oregon State Division of Forestry (State Forester's office); district office Bureau of Land Management; State Capitol.
7. **Dallas.** Tree Farms Willamette Valley Lumber Co.
8. **Otis.** Headquarters, Cascade Head Experimental Forest. Research in fog-belt forests of coastal area on 9,743 acres, national forest land. Cutting research in young-growth Sitka spruce and western hemlock in cooperation with Publishers Paper Co.
9. **Toledo.** Georgia-Pacific Corp. sawmill, veneer plant and tree farms.
10. **Corvallis.** School of Forestry, Oregon State College; Oregon Forest Products Laboratory (state); Oregon Forest Experiment Station (state); Headquarters, Willamette Research Center; research in forests of Willamette Valley and forest genetics. Headquarters, Siuslaw National Forest. Chapman Manufacturing Co. hardboard plant; State forest nursery.
11. **McKenzie Bridge.** Headquarters, H. J. Andrews Experimental Forest. Research in management old-growth Douglas-fir. Harvest and salvage cuttings, regeneration, logging and road layout, and watershed studies.
12. **Eugene.** Center of Lane County's forest industry. Sawmills in the county annually produce approximately 1½ billion feet of lumber; also plywood and veneer plants, pulp and hardboard plants. Headquarters, Wilamette National Forest. District office Bureau of Land Management. Tree farms: Booth-Kelly Lumber Co., Rosboro Lumber Co., Weyerhaeuser Timber Co., Guistina Bros., Associated Plywood, Hult Lumber Co., Long-Bell Lumber Co.
13. **Elliott State Forest.** Well stocked stand of even-aged, young-growth Douglas-fir.
14. **Gardiner.** Long-Bell Lumber Co.'s sawmill, plywood plant and tree farm.
15. **Marshfield-Coos Bay.** Forest industries concentration. Sawmills, plywood and pulp plants. Aproximately ½ billion feet of lumber shipped by water annually. Tree farm: Weyerhaeuser Timber Co.
16. **Oakridge.** Pope & Talbot, Inc. sawmill and tree farm.
17. **Roseburg.** Industrial center of Douglas County whose forests contain more than 71 billion bd. ft. of saw timber. Large number of forest industries. 1¼ billion ft. of lumber produced in county annually. Headquarters of Umpqua National Forest and Siskiyou-Cascade Research Center; District office Bureau of Land Management.
18. **South Umpqua Experimental Forest (near Tiller)** (Pacific Northwest Forest and Range Expt. Sta.). Feasibility of sugar pine management.
19. **Port Orford Cedar Experimental Forest (near Powers)** (Pacific Northwest Forest and Range Expt. Sta.). Research in management of Port-Orford-cedar.
20. **Gold Beach.** Rogue River recreational area. Famous fishing stream.
21. **Grants Pass.** Location of a number of sawmills and plywood plants. Headquarters, Siskiyou National Forest. In Rogue River Valley, Portola Lumber Co. tree farm.



GUIDE M

Locations of Interest to Forest

Society of American Fores

Portland, Oregon

E MAP

resters in West Coast States

oresters Annual Meeting

October 16-19, 1955

This guide map is designed to locate for visiting foresters some of the outstanding forestry and forest-industry activities in the West Coast States. It also includes several places of general or scenic interest. The map was prepared by a committee acting on the suggestions of several well-versed foresters located in each of the states.

The location of each activity shown on the map is indicated by a symbol and a number. A legend gives the meaning of the symbols; an accompanying list for each state gives the location, usually the nearest town, and a brief description of the activity or place of interest to which the number refers. The principal highways are indicated by official U. S. or state number. Where there are several types of forest industries in or near a given location only one symbol is used—that of "Industry Center;" tree farms are usually listed under location of company's headquarters.

The committee realizes there are many other points of interest that could have been included; for example: forest industries, tree farms, public forests, management practices, and forest-protection activities. The list was limited, however, by the map scale and the space available for descriptive material. The guide map should be considered a sample cross-section of forestry on the West Coast. It is hoped it will prove helpful to those who visit the region during the Portland convention. Committee: R. W. Cowlin, *Chairman*, John W. Allen, John Callaghan, Gustaf Juhren, F. L. Moravets.

22. **Medford.** Location of number of sawmills and plywood plants. Headquarters, Rogue River National Forest. Center of pear growing. Tree farms: Medford Corporation, Elk Lumber Co., Timber Products Co., Kogap Lumber Co., Fir Milling & Planing Co.
23. **Cave Junction.** Oregon Caves—national monument; example of fault caves and marble formations. Group of nonindustrial tree farms.
24. **Dee.** Oregon Lumber Co. hardboard plant—use unbarked slabs.
25. **Warm Springs.** Headquarters, Warm Springs Indian Agency. Indian Reserve with 4 billion bd. ft. of timber, ⅝ of ponderosa pine. Warm Springs Lumber Co., medium-size pine sawmill.
26. **Prineville.** Headquarters, Ochoco National Forest. Site of one large and four medium sawmills, chiefly pine.
27. **Bend.** Two large pine sawmills. Headquarters, Deschutes Research Center (Pacific Northwest Forest and Range Expt. Sta.) and Deschutes National Forest. Bend Forest Service nursery. Brooks-Scanlon tree farm.
28. **Gilchrist.** Gilchrist Lumber Co. pine sawmill and tree farm.
29. **Fringle Falls.** Experimental Forest near LaPine (Pacific Northwest Forest and Range Expt. Sta.). Management of ponderosa pine: harvest cuttings, regeneration, commercial thinnings, precommercial thinning, pruning, and brush control. Thinning in lodgepole pine.
30. **Crater Lake National Park.**
31. **Klamath Agency.** Headquarters, Klamath Indian Reservation. 800 M acres of forest land, ⅝ of which is stocked with ponderosa pine. One of two Indian reservations in U. S. chosen for early release from federal administration.
32. **Klamath Falls.** Large lumber center with mills of nearly 900 M combined 8-hour capacity. Plywood plant, box plants, and hardboard plant using chiefly white fir. Weyerhaeuser Timber Co. tree farm.
33. **Kinsua.** Kinsua Lumber Co. pine sawmill and tree farm.
34. **McNary Dam.** Under construction.
35. **Pendleton.** Headquarters, Umatilla National Forest. Annual roundup (Rodeo and Pageant) Sept. 14-17.
36. **Pilot Rock.** Pilot Rock Lumber Co. sawmill integrated with Oregon Fibre Products, Inc., plant producing hardboard and softboard by U. S. Gypsum process, Hansell ring hydraulic barker; Kearns Furniture Plant. Tree farm. Field chipping of lodgepole pine.
37. **Starkey Experimental Forest and Range** (Pacific Northwest Forest and Range Expt. Sta.). 25 miles SW of LaGrande. Grazing experiment relating rates of grazing; deferred and rotation grazing; and methods of natural range revegetation.
38. **LaGrande.** Mt. Emily Lumber Co. sawmill. Headquarters, Blue Mountain Research Center (Pacific Northwest Forest and Range Expt. Sta.).
39. **John Day.** Headquarters, Malheur National Forest.
40. **Hines.** Hines Lumber Co. sawmill.
41. **Malheur-Harney Lakes.** Federal wildlife refuge. Nesting site of geese, ducks, and other waterfowl.
42. **Squaw Butte-Harney Range.** Livestock experimental station—research in reseeding, eradication and conversion of cover types, fertilization practices.
43. **Summer Lake.** Migratory waterfowl. State-controlled shooting area.
44. **Hart Mountain.** Federal wildlife refuge—antelope and recent plant of bighorn sheep.
    Warner Lakes. Migratory waterfowl. State-controlled shooting area.
45. **Lakeview.** Center of lumber and box manufacturing. Ponderosa pine and white fir. Headquarters, Fremont National Forest.
46. **Interstate Deer Herd.** One of the most interesting examples of deer migration. In 1954 an stimated 19 M mule deer moved from summer range in Oregon to winter range in California.
47. **Baker.** Headquarters, Wallowa-Whitman National Forest.
48. **Eagle Cap Wilderness Area.** Mountainous recreational area. "Switzerland of America."
49. **Kell's Canyon.** Controversial proposed dam site.

Washington

1. **Bellingham.** Puget Sound Pulp & Timber Co.'s pulp plant (produces ethyl alcohol from waste liquor) and tree farm. Headquarters, Mt. Baker National Forest.
2. **Mt. Baker.** Year-long recreational area.
3. **Port Angeles.** Forest industries concentration. Crown-Zellerbach Corp's large groundwood pulp plant (370 tons 24-hour capacity) and tree farm. Headquarters, Olympic National Park.
4. **Olympic National Park.** Dense rain forests of large-size native species; herds of Roosevelt elk.
5. **Pysht.** Merrill and Ring tree farm.
6. **Forks.** Planting and seeding of Forks Burn of 1951. Experimental air seeding of burn: forest seeding and elk range grass seeding.
7. **Everett.** Forest industries concentration. 3 pulp plants with total 24-hour capacity of chemical pulp of 1,200 tons. Tree farms: Weyerhaeuser Timber Co., Simpson Logging Co., C. B. Lumber & Shingle Co. Group nonindustrial tree farms at Arlington.
8. **Seattle.** U. S. Plywood plant, Ballard Bridge, University of Washington School of Forestry. Headquarters, Snoqualmie National Forest. Tree farms: Port Blakely Mill Co., Milwaukee Land Co.
9. **Snoqualmie Falls.** Weyerhaeuser Timber Co.'s sawmill and tree farm.
10. **Port Gamble.** Pope & Talbot, Inc., sawmill and tree farm.
11. **Cedar River Watershed.** Supplies pure water to Seattle and a million board feet of logs for Puget Sound plants annually.
12. **Tacoma.** Forest industries concentration. Tree farms: St. Paul & Tacoma Lumber Co., West Tacoma Newsprint Co., West Fork Timber Co. Headquarters, Douglas Fir Plywood Assn.
13. **Raymclaw.** Tree farms: Weyerhaeuser Timber Co., Northern Pacific Railway.
14. **Orting.** Cooperative Voight Creek Experimental Forest (St. Paul & Tacoma Lumber Co. and Puget Sound Research Center). Research in management of young-growth forests, emphasis on commercial thinnings.
15. **Pack Forest.** Charles Lathrop Pack demonstration forest of University of Washington College of Forestry.
16. **Mt. Rainier National Park.** 14,408-ft. mountain with large glacier fields and alpine forests. Example glacial outwash killing commercial timber.
17. **Hisqually.** Nursery operated by Industrial Forestry Assn. for private timber landowners.
18. **Olympia.** State Capitol. State Division of Forestry (Supervisor of Forestry). Headquarters: Capital forest and nursery; Olympic National Forest; Puget Sound Research Center.
19. **Shelton.** Simpson Logging Co.'s integrated plants and tree farms. Cooperative sustained yield unit with U. S. Forest Service.
20. **McCleary.** Cooperative McCleary Experimental Forest (Simpson Logging Co. and Puget Sound Research Center). Research in management of young-growth Douglas-fir stands, emphasis on commercial thinning.
21. **Lake Quinault.** Largest recorded standing Douglas-fir tree.
22. **Hemlock.** Cooperative Hemlock Experimental Forest (St. Regis Paper Co. and Puget Sound Research Center). Research in management of young-growth western hemlock; emphasis on commercial thinning.
23. **Aberdeen-Hoquiam.** Forest industries concentration. Tree farms: Rayonier, Inc.; Mayr Bros.; Aloha Lumber Co.
24. **Montesano.** Clemons Tree Farm—first to be established in U. S.
25. **Raymond.** Weyerhaeuser Timber Co.'s sawmill and tree farm.
26. **Centralia.** Weyerhaeuser Timber Co.'s research laboratory and tree farm.
27. **Longview.** Forest industries concentration. Outstanding examples of efficient industry integration. Tree farms: Long-Bell Lumber Co.; Longview Fibre Co.; Weyerhaeuser Timber Co.
28. **Cathlamet.** Tree farms: Crown-Zellerbach Corp.; Fir-Tex Insulating Board Co.
29. **Lewis River.** Large-scale tractor logging, trucking and railroad operations of Harbor Plywood Corp. in old-growth timber.
30. **Vancouver.** Forest industries concentration. Headquarters, Gifford Pinchot National Forest. Group of nonindustrial tree farms.
31. **Camas.** Crown-Zellerbach Corp.'s pulp and paper plant—largest in West.
32. **Yacolt Burn.** State of Washington's project of rehabilitation of large 1902 burn.
33. **Wind River (near Carson or Stevenson).** Pacific Northwest Forest and Range Experiment Station's experimental forest and arboretum. Research in harvest cuttings, commercial thinnings, cultural practices, and spacing of Douglas-fir. U. S. Forest Service nursery.
34. **Glenwood.** J. Neils Lumber Co.'s tree farm, sawmill at Klickitat.
35. **Yakima.** Cascade Lumber Co.'s sawmill and tree farm.
36. **Meek's Table.** Snoqualmie National Forest. Study area to compare an ungrazed area with grazed area. Meek's Table inaccessible to cattle and sheep.
37. **Vantage.** Columbia National Wildlife Refuge—waterfowl.
38. **Wenatchee.** Headquarters, Mid-Columbia Research Center (Pacific Northwest Forest and Range Expt. Sta.). Research in big-game habitat improvement; development of rangeland conditions and standards; ecological effect of grazing on shrubs; recovery of herbaceous plants following soil disturbances by logging. Headquarters, Wenatchee National Forest.
39. **Twisp.** Wyssen Skyline Train—system of steep mountain logging.
40. **Okanogan.** Headquarters, Okanogan National Forest.
41. **Omak.** Biles-Coleman Lumber Co.'s lodgepole pine operations—tree farm and sawmill; outstanding utilization.
42. **Grand Coulee.** World's largest dam in amount of material used.
43. **Colville.** Headquarters, Colville National Forest.
44. **Spokane.** Forest industries concentration. U. S. Forest Service's Inland Empire Research Center: studies in management of western white and ponderosa pines, Douglas-fir and larch. Pole blight of white pine, and grafting and pollination of blister-rust resistant white pine.
45. **Pullman.** Washington State College, Department of Forestry, Forest Nursery.

Growth of Planted Longleaf Pine on Cutover Land and Old Fields

Longleaf pine (*Pinus palustris* Mill.) grows well on old fields. In a study in south Mississippi, satisfactory stands were obtained in 10 years by planting 1,500 to 2,000 longleaf seedlings per acre on old fields. Similar plantings on adjoining cutover land produced stands with inadequate numbers of trees starting height growth. No cultural treatment followed planting on either site.

The satisfactory stands on the old fields had from 400 to 850 crop trees[1] per acre. In contrast, the best plot on cutover land had fewer than 300 crop trees per acre. The superiority of the old-field stands is ascribed to the less intense competition from grass and brush.

The study[2], installed on the Harrison Experimental Forest in February 1941, included spacings of 500, 1,000, 1,500, and 2,000 trees per acre, planted in 5/8-acre squares. Each spacing was replicated twice on cutover land and twice on old fields.

All planting sites were classed as Ruston fine sandy loam. Before cultivation, the soil was probably quite uniform in the entire planting area. Since a detailed examination was not made when the plantation was established, the effects of farming upon soil condition are purely conjectural. Cultivation probably changed structure somewhat, and there may have been some residual fertilizer effect. However, little fertilizer was being used in south Mississippi in the middle 1930's when these fields were last in crops.

There were, however, some differences in vegetation on the two sites. On the old fields coarse weeds were giving way to pure stands of broomsedge (*Andropogon virginicus* L.), while the principal grass on the cutover area was little bluestem (*A. scoparius* Michx.), with some slender bluestem (*A. tener* [Nees] Kunth) mixed in. On the old fields, bare soil was visible between the weeds and clumps of broomsedge. On the cutover land the grass produced a matted tangle of straw which tended to overtop and smother the longleaf seedlings. Some gallberry (*Ilex glabra* (L.) A. Gray) and wax myrtle (*Myrica cerifera* L.) was present on the cutover sites.

In February 1946, most of the study area was burned over by an early morning wildfire. The fire probably killed many of the seedlings that were most heavily infected with the brown spot needle blight but, by reducing infection, it should have helped some of those that were only moderately diseased.

Tenth-year survival on the old fields differed little from that on the cutover land; the average for both was 42 percent. The most impressive difference (Fig. 1) was in the proportion of planted seedlings that had become crop trees: 34 percent on the old fields and only 17 percent on the cutover sites. The crop trees averaged 18 feet in height on old fields and 11 feet on cutover land. Statistically, the difference in heights is highly significant. Spacing had no effect on the height of crop trees. The denser old-field stands were beginning to prune themselves. There was no evidence of pruning on trees on cutover land.

It is expensive to plant 1,500 or 2,000 seedlings per acre. With better stock, modern planting techniques, and prescribed burning to control brown spot, fewer seedlings might suffice on old fields. On cutover land these same measures would be helpful, but it is questionable if old-field performance could be equalled without site preparation to reduce grass and brush competition.

R. M. Allen
Southern Forest Experiment Station, Forest Service, U. S. Department of Agriculture

[1]Crop trees as classified in this 10-year-old plantation were those longleaf that were either over 3.5 feet in height and in good vigor, or under 3.5 feet in height but exceptionally vigorous and practically free of brown spot.

[2]The study was planned by and installed under the direction of P. C. Wakeley.

Fig. 1.—Longleaf pine stands 11 years after planting at the rate of 2,000 seedlings per acre. (*Left*) Stand on cutover land, (*right*) on an old field. (*U. S. Forest Service photos*)

A Method of Determining Scale of Vertical Aerial Photos

AERIAL PHOTOS have been generally accepted as valuable aids in forest survey work. One of the problems involved in their application is that of calculating photo scale. The method employed must depend largely upon the degree of accuracy demanded.

Much has been written concerning various methods of photo scale determination. The common text-book approach uses measurements of camera focal length and height of camera above terrain. Spurr [1] discusses an empirical method of comparing the lineal distance between two points visible on a photograph with the actual distance, as scaled from accurate maps or measured on the ground. Rogers [2] shows how this method can be applied to determine average photo scale for a survey unit by calculating the scales for a sample of photographs. He adds the feature of correcting scale for change in ground elevation.

For surveying extensive and heavily forested areas, the above-mentioned methods are not always economical or practical. Application of the text-book technique may involve an unwarranted amount of time. The empirical method of making ground measurements may not be satisfactory because of difficulty in identifying the same points on pictures and on the ground or map, or difficulty in measuring the ground distance even if points are identifiable.

[1] Spurr, S. H. Aerial photographs in forestry. Ronald Press, New York. 1948.

[2] Rogers, E. J. A short cut for scaling aerial photos. Northeastern Forest Expt. Sta. Paper No. 20. 1948.

The Suggested Technique

This is a method of determining photo scale from measurements of area rather than measurements of lineal distance. The method requires that the acreage of the survey unit be known, that its boundaries be identifiable on photographs, and that data on terrain elevation, if needed for local scale corrections, be available. For any survey unit the average photo scale-fraction is the square root of the photo area over the square root of the ground area where both quantities are expressed in a common unit of measurement. The resulting scale is true for the average elevation of the unit. The scales of photos with elevations different from the average are computed by means of a correcting formula.

The procedure can best be illustrated by the use of an example. Assume that the survey unit is a town and its total acreage as listed in the census report is 11,600 acres. Six overlapping aerial photographs cover the entire area. The following steps are taken:

1. On each photo, delineate the area to be used. The boundaries of these effective areas on adjacent photos must coincide exactly, and the outline of the total effective area must be coincident with the boundaries of the town.

2. Using a dot template, compute and list the number of square inches of effective area on each photograph (see Table 1, column A).

3. List the average elevation of each effective area (column B). This figure is obtained by superimposing the effective area on a United States Geological Survey topographic map. For relatively level and moderately sloping land the elevation can be determined by inspection. However, in rough terrain it is advisable to make use of a dot template to determine the proportion of the area covered by each one-hundred-foot contour zone. A weighted average elevation for each photo can then be calculated. Elevations shown on the topographic maps are assumed to fall within the limits of accuracy required by this type of survey.

4. Compute the weighted average elevation for the town (column B) using formula (1):

$$\text{Weighted average elevation} = \frac{\Sigma\left[\text{Av. elevation of effective area of each photo (ft.)} \times \text{Effective area of each photo (sq. in.)}\right]}{\text{Total effective area (square inches)}}$$

The numerator of this fraction is computed in column C of Table 1. A weighted average is necessary since the effective areas of the photographs are not the same size.

5. Compute the average photo scale for the town (column D) using formula (2):

$$\text{Average scale for the town} = \frac{\sqrt{\text{Total effective photo area (sq. in.)}}}{\sqrt{\text{Total ground acreage} \times 6{,}272{,}640}}$$

where 6,272,640, the number of square inches per acre, is a constant for converting the denominator to inches to correspond with the numerator.

6. Determine the average scales

TABLE 1.—CALCULATION OF PHOTO SCALES FOR A SAMPLE TOWN

Photo number	A Effective area of photo	B Average elevation of effective area	C (A x B)	D Average Scale
	sq. in.	*feet*		
1	41.18	2,020	83,183.60	1:21,041
2	33.20	1,530	50,796.00	1:21,786
3	29.40	1,500	44,100.00	1:21,796
4	23.50	1,500	35,250.00	1:21,796
5	11.58	1,300	15,054.00	1:22,086
6	16.26	1,100	17,886.00	1:22,376
Total	155.12	—	246,269.60	—
Average	—	1,587.61[1]	—	1:21,666[2]

[1] $\frac{246{,}269.60 \text{ (square inches x feet)}}{155.12 \text{ square inches}} = 1{,}587.61$ feet (formula 1).

[2] $\frac{\sqrt{155.12 \text{ square inches}}}{\sqrt{11{,}600 \text{ acres} \times 6{,}272{,}640 \text{ square inches}}} = \frac{1}{21{,}666}$ (formula 2).

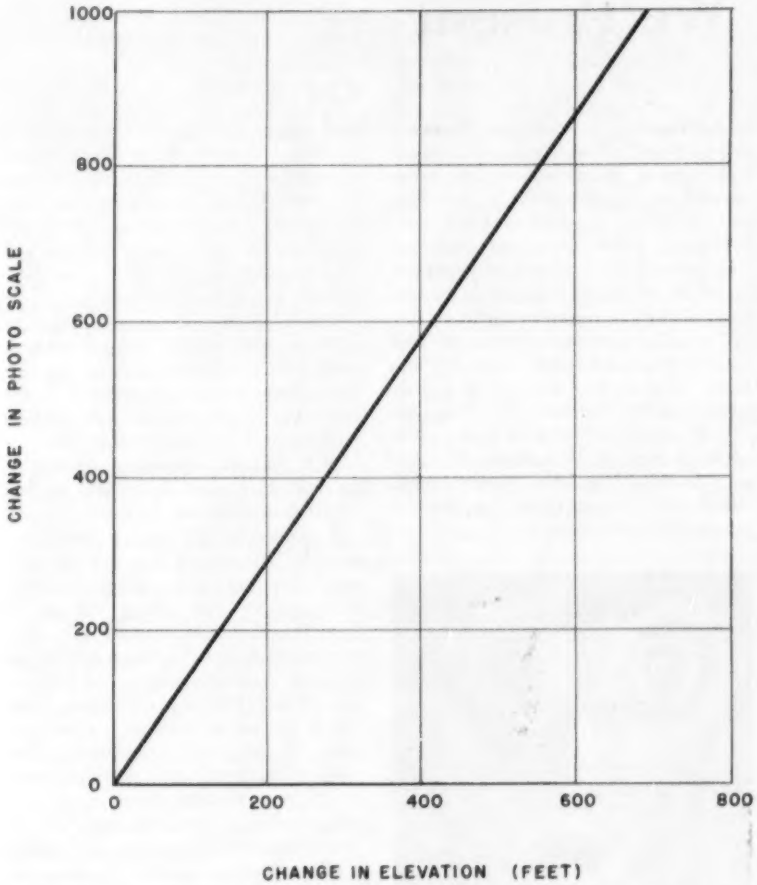


Fig. 1.—Photo scale adjustment for changes in ground elevation: 8.25-inch camera focal length.

of the individual photos (column D). To do this, a graph of photo scale adjustment for changes in elevation (Fig. 1) may be prepared using the formula:

$$\text{Photo scale} = \frac{\text{Camera focal length (feet)}}{\text{Height of camera above ground (feet)}}$$

The scale of each photo is adjusted by correcting for its difference in elevation from the mean town elevation. The average elevation of the effective area on photo No. 1, for example, is 2020 feet. This is 430 feet above the average town elevation of 1590 feet (1587.61 feet). Reading the graph, a difference in elevation of 430 feet will make a difference of 625 in the denominator of the scale-fraction, camera focal length being 8.25 inches. Scale = 1: 21,666 —625= 1: 21,041.

If the elevation were less than the average for the town, the correction would be added to the denominator of the scale-fraction.

Conclusion

The average scale for the survey unit can be accurately calculated if the total ground area is known and the area of photographic coverage is properly measured. Scales of individual pictures may also be computed if the photos are truly vertical and if their relative ground elevations and camera heights are known.

The method of photo scale determination described here is especially useful in survey units of known acreage where it is difficult to obtain ground control, but where boundaries are identifiable on photos. From experience it has proved to be both rapid and easily applied.

Robert K. Hagar and
William Nagy
State University of New York
College of Forestry,
Syracuse

We Present

James Francis Dubuar: A Man and a School

The oldest institution of its kind in the United States, and one of only two such schools in the nation, the State Ranger School at Wanakena, New York, has been a success in an educational field where others have failed. The reasons for its success are three: sound objectives from which the school has never departed, a physical plant adequate for the purpose, and a man named Dubuar.

A division of the College of For estry at Syracuse, which in turn i part of the State University of Nev York, the Ranger School has been it existence since 1912.

Strangers are often amazed that New York State, the most populous in the Union, has areas as remote and primitive as certain parts of the Adirondacks. Wanakena is in the western foothills of such an area. The village is located at the junction of the Oswegatchie River where it flows into Cranberry Lake.

With a faculty of five, the school offers a 44-week course of study and field work based on surveying and mapping, timber estimating, log and lumber scaling, logging, nursery practice, and reforestation. Practical forestry at the vocational level, the training fits men for positions such as rangers, forest estate managers, nursery foremen, surveyor's assistants, and numerous other vocations where skills are needed above those of the woodsman yet of less than full professional competence.

Graduates of the course receive a certificate. Those who elect to continue their forestry education are admitted with advanced standing, usually as sophomores, by most colleges.

Through February 1955, the school has graduated 1,166 men. Of these graduates, 200 have gone on to obtain collegiate training in forestry. But a number have attained positions of high responsibility, especially in the forest products industry, without further training in forestry, convincing proof of the success that the school has had in reaching its objectives.

When on June 11, 1919 James F. Dubuar arrived to assume his duties as assistant professor of forestry, the school had been in existence for seven years—years of struggle, of few rewards, and of frustration, but years also of accomplishment in a modest sort of way. A physical plant consisting of a few inadequate buildings was scarcely an inspiring environment in which to begin a career in education. But it is a characteristic of this self-effacing man that, for all his lack of pretension, he is not easily discouraged. That he was also a man of unusual capacity for work is attested by a statement in a letter he wrote after his first year at Wanakena. "I have been teaching," he said, "mensuration, silviculture, forest protection, and a number of short courses."

JAMES FRANCIS DUBUAR

Born in Northville, Michigan, March 17, 1891 Dubuar was graduated from the local high school in 1909. The University of Michigan awarded him the A. B. degree in 1913 and the M.S.F. degree in 1915.

As was customary with most young forestry graduates of those days, he took the U. S. Civil Service examination for forest assistant, passed it, and on July 1, 1915 was appointed to a timber reconnaissance party in Wyoming and Utah. After two years with the Forest Service in the Intermountain Region, during which period the United States became involved in World War I, he enlisted in the Army on July 9, 1917, and was subsequently assigned to the 10th Engineers (Forestry) of the American Expeditionary Force.

As first sergeant of Company F, he spent 17 months in France. His company logged and operated a sawmill of 20 M-foot capacity in the Jura. When his outfit returned to the United States, Company F held records for the largest volume sawn during one shift, for one day, for one month, and for the total amount cut. Definitely, 1st. Sgt. Dubuar was a top producer.

Following his Army discharge in 1919, he was offered another assignment with the Forest Service, but declined it to accept appointment to the faculty of the Ranger School. During 1920 he was acting director, and on July 1, 1921 was appointed director of the school, a post in which he has served faithfully for 34 years.

A student's life during the early years of the school was not an easy one. Sleeping and eating facilities were meager and rough. Overflows from the inadequate frame dormitory were accommodated in tents. With the academic year starting in mid-March and ending then in December, there was a period at each end when students cut their own considerable stove wood requirements and shovelled snow to get to meals and classes.

In truth, married members of the faculty who then lived in the village of Wanakena, a couple of miles distant, did not exactly have a bed of roses either. During winters of heavy snowfall, which occurred practically every year, they had the choice of two methods of transportation—skis or snowshoes. On occasion the temperature dropped to 40° below zero.

This, be it remembered, was before the time of paved roads and motorized snow removal equipment. Students, food, supplies, and everything to be transported arrived via railroad at Benson Mines, eight miles away, and were then hauled to school by sleigh or wagon, depending on the season. Until 1928 Wanakena was at the end of a stub road from Benson Mines; there were no paved roads within twenty miles.

In that year the present main building was completed. Planned, largely by Dubuar himself, specifically for vocational instruction, the physical plant is ideal for the purpose. There is not another like it, or as well equipped, in America.

A major source of strength of the Ranger School, and a possible reason why the institution has been successful whereas others of similar character

have flourished briefly and then gone out of existence, is that from the start it was distinct and physically apart from a school of professional training.

As was mentioned earlier, other schools of this kind have had relatively short lives. In most cases, they were unsuccessful because they tried to be something more than a vocational school with the result that they lengthened their courses or otherwise expanded so that their graduates were competing with professionally educated foresters. In short, they were neither ranger schools on the one hand nor professional schools on the other. Dubuar never made this mistake. Believing that there is a definite need in forestry for the vocationally trained ranger, he has stuck to that objective and has avoided curricular frills.

This is not to imply that Dubuar and the school have not been progressive. Several years back he eliminated a course in grazing simply because, it was found, very few graduates ever had use for it. He added photogrammetry when that specialty became increasingly valuable in forest management. Likewise, he increased the emphasis on logging. Instruction in radio communication, with less emphasis on telephone line work, is another objective. With the rapid mechanization of forest operations, he has kept instruction up to date in the use of labor-saving and mechanical equipment. The school owns a representative list of such field equipment, from tractors to power saws. Modern office technique, using electric adding machines and calculators, is another type of instruction that has been kept abreast of the times.

At one period or another during his 36 years at the school Dubuar has taught every one of the twenty-odd different courses that have comprised the curriculum. By the testimony of both fellow teachers and students, all subjects have been well taught, a feat admittedly requiring unusual ability and a great store of knowledge.

During the period 1913-1955, 41 classes were graduated with a total of 1,166. The largest class was that of 1947 with 48 graduated. The smallest, in 1945, had 6. Approximately 200 graduates subsequently attended professional forestry schools and obtained degrees; 15 went on to obtain degrees in engineering, and 20 obtained degrees in other professions.

In all, about 78 percent of the men who entered the Ranger School were graduated, and about 75 percent of the graduates are employed in forestry or in closely allied occupations for which the school provided their training. About 42 percent of the graduates working in forestry are in industry (6 percent operate their own businesses); 29 percent are with state and provincial governments; 27 percent with federal agencies; and 1 percent with city and county governments.

Although no other ranger school in the United States has ever lasted more than ten years (the Ranger School of the University of Florida was not started until 1947), several similar institutions have adapted their curriculums after that of the New York school. In its first bulletin the Florida school mentioned that its course was patterned after the one at Wanakena. The Maritime Ranger School in New Brunswick, the Ontario Forest Ranger School, and a similar school in Saskatchewan used some of the features of the New York school as guides. A subprofessional school, under process of development in far-off Iran, will likewise reflect many features of the little institution on Cranberry Lake.

Dubuar's devotion to the school, his insistence over the years in giving all his time to it and to his students, has resulted in the Dubuar name being less well known than that of many other forestry educators. He has been a loyal member of the forestry profession, but in sticking to the main job at hand he has not participated widely in professional affairs, and such participation has always been secondary to his teaching responsibilities. He has never written a textbook or a bulletin. In fact, he has attended but relatively few meetings, has presented but few papers, and has written but few articles, although those he has written have been marked by practicality and clear thinking.

But even though, as has been quite evident, Dubuar is not a conservation crusader, let no one underestimate the value of his contribution to forestry. The graduates who have passed through the school since he went there in 1919 are living evidence of it, evidence of which any educator however eminent might be proud.

If by this point the reader has gained the impression that Dubuar is a recluse who shuns society, nothing can be farther from the truth. It is simply his nature to avoid the spectacular and the limelight. The fact that he is not widely known professionally bothers him not in the least. Parenthetically, he is well enough regarded to rate a biography in *Who's Who in America*, a form of recognition which money cannot buy and which is not given unless deserved.

Character is easier to perceive than to define. The influence of Dubuar's character on the lives of the men who have passed through the Ranger School has been as valuable as the technical knowledge he has imparted. By his own example, he has instilled in the men a sense of integrity and fair play, loyalty to employers, and responsibility for doing a job right.

His course in Elements of Forestry, for example, covers the general history of the forestry movement both in Europe and America, but over the decades he has developed it into something more than that. Recognizing in later years its true worth, graduates realize that it could well be renamed "Elements of Forestry and Basic Character Building" without in the slightest degree detracting from the forestry fundamentals of the course.

It is an interesting commentary on the strength of this man's personality that in a school with up to 60 students in residence, without a proctor to oversee their behavior, no damage has ever been done to the dormitories because of youthful highjinks.

Long an ardent baseball fan, he gave up playing with the students several years back but still umpires local games. His favorite sport is fly fishing—a sport in which he claims he is several years behind—and wildfowling and upland bird hunting. Gardener, music lover, and omniverous reader of history and biography, Dubuar enjoys a well-rounded collection of hobbies.

Under Dubuar's leadership, the ranger school type of training, originally patterned after similar schools in Europe, has attained a useful and respected place in American forestry education. His enduring faith in the need for subprofessional training and in the opportunities for men so trained has caused him to forego advancement in his own university and better paid positions elsewhere. A dedicated man, he has devoted his professional career to this field of forestry education. The profession is the richer for his devotion to an educational ideal. Forestry is further along because of the men he has trained.

As long as the Ranger School endures it will serve as a living monument to Jim Dubuar's career. He needs no other.

EARL PORTER

(The author acknowledges with thanks assistance by Henry Clepper and Philip J. Haddock in the preparation of this article.)

Reviews

Pulp and Paper Manufacturer Vol. 4: Auxiliary Paper Mill Equipment

J. Newell Stephenson, editor-in-chief. 732 pp. Illus. McGraw-Hill Book Company, Inc., New York 36, N. Y. 1955. $9.

This is the final volume in the new series on pulp and paper manufacture prepared under the direction of the Joint Textbook Committee of the Paper Industry of the United States and Canada. The material is primarily of a supplementary nature to the information in Volumes 1, 2, and 3, published since 1950, which treat the materials, processes, and equipment used in the manufacture of pulp and paper.

Foresters are perhaps most familiar with the first volume of the present series — Preparation and Treatment of Wood Pulp—as it contains chapters on the structure and properties of pulpwood and on the preparation of pulpwood. Volume 2 covers the preparation of stock for paper making, and Volume 3 deals with the manufacture and testing of paper and board.

The manufacture of pulp and paper requires the use of a considerable amount and variety of equipment that is not actually a part of the manufacturing process. The present volume covers quite well the various departments that supply water, steam, power, electricity, ventilation, the handling of fluid and solid materials, lubrication, process control, and the instruments employed in a paper mill.

Under the able editorship of J. N. Stephenson many recognized authorities have prepared the chapters covering these subjects. They have had the ready cooperation of a large number of manufacturers. The result is a very commendable job certain to be of considerable use to students and to workers in the paper industry.

IRVING H. ISENBERG
The Institute of Paper Chemistry

Our Natural Resources, Their Development and Use

Juniata Morris Kreps, editor. 189 pp. H. W. Wilson Company, New York, N. Y. 1955. $2.

Here is a collection of abridged speeches and articles which, while somewhat top-heavy with the policy phases of administering power and energy, touches on all natural resources except the atmosphere. The series of which it is a part is devoted to "current controversial questions" which no doubt accounts for almost a complete lack of any discussion of the physical nature of the natural resources themselves.

The book is divided into five parts: I, Ownership and Control of Our Natural Resources: Background and Principles; II, Hydroelectric Power; III, The Tidelands; IV, Public Lands; and V, Atomic Energy. Finally, there is an extensive bibliography. Each of the five parts is preceded by an "Editor's Introduction" which skillfully clears the decks for the discussions which follow.

It is easy to criticize the selections of pro and con advocates but in general this has been well done. One notices, however, the striking absence of writers who have themselves ever handled or tried to administer a natural resource project, be it a mine, a hydroelectric installation, a herd of wild animals or a tract of public land. One exception is Samuel T. Dana, whose article on "Private Forestry in Transition" appears to this reviewer to be the most objective selection in the entire book.

Much of the material boils down to defense or criticism of the conservation policies of the New Deal and the Fair Deal on the one hand and the Eisenhower Republican Administration on the other.

Those who fail to understand (and who does not?) the Dixon—Yates controversy, will find an analysis of the question in Part II on Hydroelectric Power, from *The United States News and World Report*. This is followed by President Eisenhower's statement of his position, to the chairman of the Atomic Energy Commission, and by the Democratic Party's view by Senator Estes Kefauver.

The bibliography contains 267 items including those briefed in the text. In this list one finds only one technical journal. This is the *Bulletin of the Atomic Scientists*. Such a fact should give pause to foresters and others. Can it be that these trained men are not interested in policies? Wasn't there a time when the JOURNAL OF FORESTRY published vigorous editorials?

SHIRLEY W. ALLEN

Floods

By William G. Hoyt and Walter B. Langbein. 469 pp. Illus. Princeton University Press, Princeton, N. J. 1955. $7.50.

As commented by the authors in their preface, "Floods have been many things to many people." Also, they form a tremendous and perennial problem, of world-wide scope. These facts are enough reason for the valuable series of books that is developing in the general field of water, watershed management, and flood control. This one deals entirely with floods, not so much the social or legal problems associated with them, but almost exclusively their physical and engineering aspects.

The authors start logically with a statement of flood problems and why we have them: the meteorological and mechanical basis for their development. With this background, they then develop a picture of a flood's life history and of the kinds of damage that are caused. This leads naturally into the various ways in which man has adapted himself to the inevitable existence of floods: through zoning, insurance, flood forecasting, flood relief and rehabilitation, and finally through control of water by

dikes and levees, channel improvements, diversions, reservoirs, and land-use practices. Bringing into focus the situation in the United States, the authors then briefly discuss the legal aspects of floods, and outline in considerable detail the general policy and the specific projects and plans that are being developed in various regions of the United States.

The book closes with a final chapter of particular interest to both technicians and laymen: an outline of the history of floods in the United States. The hydrologist can use this chapter as a starting point for seeking further information on historical floods. Laymen find personal interest in looking up and reading about floods that are within their own experience or that of their friends and relatives.

To foresters, one special feature of this book deserves attention: it was written by engineering hydrologists, and therefore emphasizes especially the engineering and structural aspects of flood control. The growing body of technical information on vegetation influences and watershed management is almost ignored; and the book exhibits a noticeable lack of understanding of the known, probable, or logical effects of land management in the reduction of floods and flood damages. For this reason foresters and other land managers will find this new book less useful than it might have been, if it had better developed the integrated relationships of land management and engineering work in flood control.

H. G. WILM

Handling Forest Tree Seed

By H. I. Baldwin and G. D. Holmes. 110 pp. Columbia University Press, New York 27, N. Y. 1955. $1.

Published by the Food and Agriculture Organization of the United Nations this bulletin consists of two parts. Part 1, "Methods of Handling Forest Tree Seed from Procurement to Packaging" is by H. I. Baldwin of New Hampshire, and Part II, "International Rules for Testing Seed of Forest Tree Species" by G. D. Holmes of England.

Part I covers the usual methods of tree seed procurement, collection, extraction, cleaning, storage, and testing which are familiar to those handling tree seed and covered in the literature. Since there is an international aspect and emphasis is placed on seed exchange, that portion on packaging for shipment and the control of insects and diseases in storage and transit is of special interest.

A method of coating large seed, such as the oaks and chestnut, with parowax is described in detail. Such treatment maintains the relatively high moisture required of this type of seed. Also described is the packaging of dry seed, such as the conifers, by the use of such modern materials as aluminum foil and several plastic products.

Of importance also is the control of insects and diseases accompanying some seed. Treatments to prevent the spreading of these organisms are described in some detail.

The value of seed testing in connection with international exchange is emphasized. Impurities not only increase weight but may include other seed and materials which should not be transferred to other parts of the world.

Genuineness or trueness to name is of special importance since many lots of seed are for experimental purposes and subsequent results could be based upon untrue material. In connection with essential records and data on provenance, the reviewer suggests that each seed lot be given a number for reference to be used in the handling of the seed from collection to the ultimate plantation.

Part II on the international rules for testing, although an extract, contains many details. In general the testing of forest tree seed is a complex technique as indicated by the rules and equipment required. The methods described are statistically correct, but for the ordinary collector or user of tree seed less complicated procedures can be followed.

The appendices contain FAO forms for certificates of origin and quality, for consignment, and one on international seed analysis. Seven pages of references relate to the subjects discussed.

The bulletin is a good "refresher" on the subject and for the small cost is well worth having.

E. J. ELIASON
New York
Conservation Department

Tree Seed Notes: I Arid Areas—II Humid Tropics

F.A.O. Forestry Development Paper No. 5. 354 pp. Columbia University Press, New York 27, N. Y. 1955. $3.50.

Foresters engaged in the F.A.O. Technical Assistance Program in the Middle East and tropics have need of information on tree species that might be introduced for erosion control and improvement of the economy. This usually means importing seeds and growing the plants in nurseries. The present manual is another in a series of handbooks designed as references for their guidance. The authors, E. Magini of Italy and N. P. Tulstrupp of Denmark, state in a brief introduction that the USDA Woody Plant Seed Manual served as a model. It is recognized that the information on the species covered in the present book is often scanty, and users of the manual are urged to send in comments and corrections.

As indicated in the title, the book is divided into two parts, one devoted to species suggested for trial in arid and semi-arid conditions in the tropics and subtropics, including high altitudes, and the second part to humid tropic conditions. The plan of treatment is to list all available information on each species separately in outline form. One to four pages are devoted to each species. Species are arranged alphabetically by botanical name regardless of family relationship. In most cases the common or vernacular name is also given, and in some cases names in other languages. Then follows a list of "Chief Uses,"

a description of the natural range, soil and climate, and knowledge (if any) of races. Frequently botanical varieties are also given under this heading. The essential information on age of seed-bearing, time and methods of seed collection, extraction and storage, germination percent, and treatment of seed prior to sowing are briefly described. The final heading "Remarks" reports countries and conditions where introduction has been successful and recommendations on where trial should be made.

Part II in addition contains a summary table indicating whether the seed is hard or easy to store, and the soil to be preferred. Part I lists 88 and Part II 95 species.

Due to the lack of authentic information on many of these trees that have been little used in reforestation or afforestation it is natural that much of the information is fragmentary. The compilation represents a vast amount of research and correspondence that can hardly be realized. The authors are to be congratulated upon making these data available in simple, easily understood form.

The arrangement alphabetically by species takes the place of an index, but an index to botanical names and another index to common names would be a useful addition, since synonyms and varietal names are not listed in the table of contents at the beginning of each section. The preferred scientific name, with authority, heads each page, in some cases followed by synonym in italics (often without the authority). No indication of what system of nomenclature was followed is given. The heading "Species" for the common and vernacular names appears inept. It would be helpful if the name of the language other than English were given for each of these latter names. The heading under which common names are listed is often omitted. In such cases it would be preferable to have the heading read "Common Name: None."

Under seed collection it would also be useful to include a note as to whether the tree is monoecious or dioecious.

The authorities for some statements in the descriptions are given by last name in parentheses, rarely followed by a date, but there is no list of references to which these refer. It has doubtless been the intent of the authors to avoid encumbering the manual with footnotes and citations (there are none!) but the failure to provide references to the names cited makes their citation of doubtful value.

Geographical and climatic data are given in brief, but adequate form. Temperatures are in degrees Fahrenheit only, but altitude is in both feet and meters and rainfall in both inches and millimeters.

The method of printing resulted in great waste of space, although this provides room for the user of the handbook to insert his own notes on each page. It is difficult to understand why the heading of the species should begin one-quarter of the page down from the top. It would be far easier to find if this heading was nearer the top. One page rather than two would then suffice to cover one species in some cases. There are remarkably few typographical errors, and the book is printed in large, clear type on good paper. This handbook should prove invaluable to those engaged in planting in the sub-tropics and tropics, and should also stimulate research to fill in the gaps in knowledge of the characteristics of these and other hot climate species.

HENRY I. BALDWIN
New Hampshire Forestry and Recreation Commission

Publications of Interest

Manpower Resources in the Biological Sciences is a publication of the National Science Foundation. It is a report based on a questionnaire survey conducted by the National Scientific Register in 1951, with the cooperation of the American Institute of Biological Sciences, the Federation of American Societies for Experimental Biology, and their affiliated societies.

The scientists who carry on research, teaching, and other professional activities in all areas of biology are estimated to number about 50,000. This report presents basic information on their educational background, employment, and other characteristics.

* * *

The *1955 Pulpwood Annual*, edited by the American Pulpwood Association, is off the press and ready for distribution. This 64-page publication contains complete sections on (1) Woods Training, Safety and Supervision; (2) Pulpwood Preparation, Handling and Hauling; (3) Industrial Forestry and Wood Utilization; and (4) A Projection of the Next 50 Years and Meeting Its Demands.

The *Annual* also contains discussions on legal status of pulpwood producers; pulpwood logging trends; and the insurance factor in production of pulpwood. Men from the industry participated in making this material available for publication.

Copies of the *1955 Pulpwood Annual* may be obtained by writing to *Pulpwood Annual*, 370 Lexington Ave., New York 17, N. Y., at $1.00 per copy.

* * *

The Romance of Trees in Fact and Fancy by Mary Funk Hazel is, in the author's words, not intended as a guide but rather as a book for the enjoyment of the tree hobbyist. It presents factual matter such as species characteristics, which are described in nontechnical terms, wood uses, and other pertinent material of use to the student, but its main approach is along aesthetic lines. An interesting section discusses folk-lore, myths, and legends. Persons who share the author's poetic interest in trees will find the book interesting—and unusual because of its approach to the subject of trees. Published by the author, 1717 R St. N.W., Washington, D. C. Price $2.50.

* * *

A five-minute noncommercial 16mm film on pressure treatment of fence posts, produced by Iowa State College in cooperation with The Dow Chemical Company, is available on loan.

Prof. R. B. Campbell, extension forester, and Prof. G. B. Hartman, head of the Iowa State College forestry department, narrate the film.

The film may be obtained by writing to Public Relations Department, The Dow Chemical Company, Midland, Mich.

Current Literature

Compiled by MARTHA MEELIG, *Librarian, State University of New York College of Forestry*

Range Management Section Compiled by FRANCES FLICK, *Library, U. S. Department of Agriculture*

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Forest Products

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Pathology

Control of the Dutch Elm Disease in New York State. By D. S. Welch and J. G. Matthysse. 14 pp. Illus. New York State College of Agric., Ithaca. 1955. Cornell Ext. Bul. No. 932.

The Distribution and Prevention of Oak Wilt. By E. F. Honey. 7 pp. Illus. Pennsylvania State Univ. College of Agric. Ext. Serv., University Park. Cir. No. 448.

Floral Morphology of White Oak. By H. S. Turkel, A. L. Rebuck, and A. R. Grove, Jr. 14 pp. Illus. Pennsylvania State Univ. Agric. Expt. Sta., University Park. 1955. Bul. No. 593.

Protection

Biology and Control of the European Pine Shoot Moth. By W. E. Miller and R. B. Neiswander. 31 pp. Illus. Ohio Agric. Expt. Sta., Wooster. 1955. Research Bul. No. 760.

The European House Borer Hulotrupes bajulus *(L.) and its control in the Western Cape Provinces.* By H. J. Dürr. 78 pp. Illus. Union of South Africa Dept. of Agric. 1954. Bul. No. 337. 1s.

Organization and Conduct of Forest Aerial Surveys in Oregon and Washington. By J. F. Wear and W. J. Buckhorn. 40 pp. Pacific Northwest Forest & Range Expt. Sta., Portland, Ore. 1955. Mimeog.

Range Management

The Great Roundup. By L. Nordyke. 288 pp. Illus. Wm. Morrow & Co., 425 Fourth Ave., N. Y. 16. 1955. $5.00.

Grundlagen der Weidewirtschaft in Südwestafrica. (Grazing Economy in Southwest Africa. In German.) By H. Walter and O. H. Volk. 281 pp. Illus. Eugen Ulmer, Stuttgart, Germany, 1954. Price not known.

Microclimatological Profiles in Grass Cover in Relation to Biological Problems. By F. L. Waterhouse. Royal Meteorological Society, Cromwell Rd., London S. W. 7. Quarterly Jour. Vol. 81, No. 347, pp. 63-71. Jan. 1955. Reprint 25 cents.

Progress in Range Improvement. By E. H. McIlvain and D. A. Savage. Advances in Agronomy, Academic Press, 125 East 23rd St., N. Y. 10. Vol. 6, pp. 1-65. 1954. $8.00.

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The Clements Growth Prediction Charts for Residual Stands of Mixed Conifers in California. By D. F. Roy. 10 pp. California Forest & Range Expt. Sta., Berkeley. 1955. Tech. Paper No. 9. Mimeog.

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Wood Technology and Utilization

Detection of Figured Wood in Standing Trees. By M. Y. Pillow. 3 pp. Illus. U. S. Forest Products Lab., Madison, Wis. 1955. Rept. No. 2034. Mimeog.

Indian Timbers for Slate Frames. By M. A. Rehman, Jai Kishen and M. L. Mehra. 3 pp. Manager of Publ., Delhi, India. 1954. Indian Forest Leaflet No. 138. As.-/6/-, or 7d.

Logging Waste in Eastern Canada. By J. A. Doyle. 24 pp. Illus. Canada Dept. of Northern Affairs and National Resources, Ottawa. 1954. Forestry Branch Bul. No. 115.

Properties of White-Pocket Douglas-Fir Lumber. By L. W. Wood. 15 pp. Illus., tables. U. S. Forest Products Lab., Madison, Wis. 1955. Rept. No. 2017. Mimeog.

Technologie des Holzes und der Holzwerkstoffe. By Franz Kollmann. Vol. II. 1199 pp. Illus. Springer, Berlin. 1955. DM 136.

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Wood-Frame House Construction. By L. O. Anderson and O. C. Heyer. 235 pp. Illus. U. S. Dept. of Agric., Washington 25, D. C. 1955. Agric. Handbook No. 73. 65 cents.

Society Affairs

Officers and Council
1954-1955

E. L. DEMMON, *President*
Southeastern Forest Experiment Station
Federal Building
Asheville, N. C.

DEWITT NELSON, *Vice President*
Department of Natural Resources
State Building 1
Sacramento, Calif.

HENRY CLEPPER, *Executive Secretary*
Mills Building, 17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

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Woodlands Department
Kimberly-Clark Corporation
Neenah, Wis.

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U. S. Forest Service
Federal Building
Missoula, Mont.

J. HERBERT STONE
U. S. Forest Service
729 N.E. Oregon St.
Portland 8, Ore.

D. B. DEMERITT
Dead River Company
6 State Street
Bangor, Me.

EDWIN F. HEACOX
Weyerhaeuser Timber Company
Tacoma 1, Wash.

RUTHFORD H. WESTVELD
Department of Forestry
University of Missouri
Columbia, Mo.

Annual Meeting

Society of American Foresters

Portland, Ore., October 16-19, 1955

Theme: "Converting the Old Growth Forest"

Schedule of Events

Members, their ladies, and guests who plan to attend the meeting are urgently requested to arrive in Portland on Sunday, October 16, or not later than the morning of Monday, October 17. The opening general session starts on Monday morning.

As will be seen from the following schedule of events, numerous meetings and technical sessions have been arranged to provide attractions for a diversity of interests. The September issue of the JOURNAL will contain the final program of topics and speakers.

Sunday, October 16

S.A.F. Council meeting: morning and afternoon.

Committee on Advancement of Forestry Education: afternoon.

Field Trip to Portland City Forest and Gallery of Trees: afternoon.

Editorial Board, JOURNAL OF FORESTRY: evening.

Joint meeting of Council and Section delegates: evening.

Association of Consulting Foresters: evening.

Monday, October 17

Opening General Session: morning.

Society Affairs Session: afternoon.

Division of Education: evening.

Division of Private Forestry: evening.

Division of Range Management: evening.

Tuesday, October 18

Division of Silviculture: morning and afternoon.

Division of Forest Recreation: morning.

Division of Public Relations: morning.

Division of Forest Products: afternoon.

Division of Forest-Wildlife Management: afternoon.

Social evening with Columbia River Section and Puget Sound Section as hosts.

Wednesday, October 19

Division of Forest Management: morning and afternoon.

Division of Forest Economics and Policy: morning.

Division of Watershed Management: afternoon.

The annual Society Dinner: evening.

Thursday, October 20

Industrial Tree Farm Field Trip: all day.

Tillamook Burn Field Trip: all day.

Friday, October 21

Mt. Hood National Forest Field Trip: all day.

Forest Industries Field Trip: all day.

General Meeting

Monday, October 17
Henry Schmitz, Chairman
Morning Session
Theme: "Converting the Old Growth Forest."

1. Introduction by Chairman Schmitz.
2. Welcome by Governor Paul Patterson of Oregon.
3. "Preserving the Public's Interest in Converting the Old Forest to New." Arthur W. Greeley, U. S. Forest Service, Juneau, Alaska.
4. "Managing the Forest in the Conversion Process, with Particular Reference to Road Development." E. P. Stamm, Crown Zellerbach Corporation, Portland, Ore.
5. "Protecting the Resource in Converting the Old Forest to New." DeWitt Nelson, Department of Natural Resources, Sacramento, Calif.

Society Affairs

Monday, October 17
E. L. Demmon, President
DeWitt Nelson, Vice President

Afternoon Session

1. "The Timber Resource Review." Richard E. McArdle, U. S. Forest Service, Washington, D. C.
2. Report of the President, E. L. Demmon.
3. Report of the Executive Secretary, Henry Clepper.
4. Report of the Editor, Arthur B. Meyer.
5. Committee Reports.

Open forum discussion.

Division of Education

Monday, October 17

Archie E. Patterson, Chairman
W. F. McCulloch, Vice Chairman
David M. Smith, Secretary

Evening Session

1. "A Program of Summer Employment for Pre-forestry High School Graduates." Walter H. Schaeffer, College of Forestry, University of Washington, Seattle, Wash.
2. "Earned Doctor Degrees in Forestry." Joseph S. Illick, College of Forestry, State University of New York, Syracuse, N. Y.
3. "Limiting Enrollments in the Schools of Forestry." Glen R. Durrell, Department of Forestry, Oklahoma A & M College, Stillwater, Okla.
4. "Handling Large Enrollments Without Lowering Standards of Instruction." James D. Snodgrass, School of Forestry, Oregon State College, Corvallis, Ore.

Discussion.

5. "The Case for the Generalized Curriculum in Forestry." George B. Hartman, Department of Forestry, Iowa State College, Ames, Iowa.
6. "The Case for the Regionalized Curriculum in Forestry." Gordon D. Marckworth, College of Forestry, University of Washington, Seattle, Wash.

Discussion.

Division of Range Management

Monday, October 17

Charles E. Poulton, Chairman
Bert H. Tucker, Vice Chairman
Elbert H. Reid, Secretary

Evening Session

Panel Discussion: "Site Classification as We Convert Old Forest Ranges to New."

1. Remarks by Division chairman.
2. "Principles in the Use of Vegetation to Indicate Grazing Potentials of Forest Land." Rexford Daubenmire, Department of Botany, State College of Washington, Pullman, Wash.
3. "Soil-Vegetation Surveys as an Aid in Range Management." Robert A. Gardner, California Forest and Range Experiment Station, Berkeley, Calif.
4. "Site Classification as a Basis for Game Range Management." Fred W. Johnson, U. S. Forest Service, Missoula, Mont.
5. "Site Classification as a Basis for the Improved Design and Interpretation of Research." David F. Costello, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.
6. "Range Management on a Scientific Basis as We Convert from Old Ranges to New." Gerald D. Pickford, U. S. Forest Service, Steamboat Springs, Colo.

Division of Private Forestry

Monday, October 17

W. D. Hagenstein, Chairman
Arthur W. Nelson, Jr., Vice Chairman
Clarence Richen, Secretary

Evening Session

Program not received.

Division of Silviculture

Tuesday, October 18

John W. Duffield, Chairman
Carl Ostrom, Vice Chairman
George R. Staebler, Secretary

Morning Session

1. "Forest Succession Following Fires in the Interior of Alaska." Harold J. Lutz, School of Forestry, Yale University, New Haven, Conn.
2. "Clearcutting as a Silvicultural System in Converting Old Forests to New in Southeast Alaska." H. E. Andersen, Alaska Forest Research Center, Juneau, Alaska.
3. "Silvical Factors Influencing Resistance of Ponderosa Pine to Bark Beetle Attack." E. W. Mogren, School of Forestry and Range Management, Colorado A & M College, Fort Collins, Colo.
4. "The Silvicultural Importance of the Sitka Spruce Weevil in Coastal Oregon and Washington." K. H. Wright, Pacific Northwest Forest and Range Experiment Station, Portland, Ore., and Donald Baisinger, Crown Zellerbach Corporation, Portland, Ore.
5. "Effect of Ripeness on the Viability of Sugar, Jeffrey, and Ponderosa Pine Seeds." Gilbert H. Schubert, California Forest and Range Experiment Station, Berkeley, Calif.
6. "Where Are We in Natural Regeneration Research in the Douglas-fir Region?" Leo A. Isaac, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

Afternoon Session

Panel Discussion: "Forest Soils."
Moderator: Stanley P. Gessel.

1. "Forest Soils of the Pacific Northwest." Robert F. Tarrant, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.
2. "Effect of Tractor Logging on Soils and Regeneration in the Douglas-fir Region of Southwest Washington." Eugene C. Steinbrenner, Weyerhaeuser Timber Company, Centralia, Wash.
3. "Soils in Relation to Site Index Curves." Stephen H. Spurr, School of Natural Resources, University of Michigan, Ann Arbor, Mich.
4. "Forest Tree Nutrition and Forest Fertilization." T. N. Stoate, MacMillan & Bloedel, Ltd., Nanaimo, B. C., Canada, and Richard B. Walker, Department of Botany, University of Washington, Seattle, Wash.
5. "Soils Information for the Use of the Practicing Forester." Warren Starr, Department of Soils, Washington State College, Pullman, Wash.

Discussion.

6. Business meeting.

Division of Public Relations

Tuesday, October 18

Ralph G. Unger, Chairman
A. K. Wiesendanger, Vice Chairman
C. W. Mattison, Secretary

Morning Session

Panel Discussion: "Public Aspects of Old-Growth Cutting on Multiple Uses of a Forest Community."

1. "Park Preservation." Richard M. Leonard, Sierra Club, San Francisco, Calif., and Mrs. T. Wetherford, General Federation of Women's Clubs, Arlington, Ore.
2. "Roadside and Scenic Strip Preservation." Kenneth A. Reid, Whitney Industries, Inc., Sabattis, N. Y.
3. Summary. Marshall T. Dana, U. S. National Bank, Portland, Ore.

Division of Forest Recreation

Tuesday, October 18

William N. Parke, Chairman
Donald P. Duncan, Vice Chairman
James P. Gilligan, Secretary

Morning Session

1. "Conversion of the Virgin Forests in Parks." Newton B. Drury, Department of Natural Resources, Sacramento, Calif.
2. "The Value of Forest Recreation at the State Level." John Vanderzicht, Washington State Parks and Recrea-

tion Commission, Seattle, Wash.

3. "Searching for the End of the Rainbow." G. E. Cannon, Standard Insurance Company, Portland, Ore.

4. "Managing Timber Stands for Recreation." John Sieker, U. S. Forest Service, Washington, D. C.

Division of Forest Products

Tuesday, October 18

Lincoln A. Mueller, Chairman
Russell Stadelman, Vice Chairman
Stephen B. Preston, Secretary

Afternoon Session

Panel Discussion: "Utilization of Wood Residue for Hardboard."

1. Coreboard and Pulp." Ralph Chapman, Corvallis, Ore.

2. "Improving Veneer, Plywood, and Lumber with Paper Overlays." Robert Seidl, U. S. Forest Products Laboratory, Madison, Wis.

3. "Wyssen Skyline Logging." E. E. Matson, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

4. "Growth and Use of Laminated Wood Structure." Ward Mayer, Timber Structures, Inc., Portland, Ore.

5. "Pulping Hardwoods."

Division of Forest-Wildlife Management

Tuesday, October 18

Ralph T. King, Chairman
Avon Denham, Vice Chairman
C. Frank Brockman, Secretary

Afternoon Session

Panel Discussion: "The Effect of Logging Old-Growth Timber on Wildlife." Discussion Leader: Frank R. Butler, British Columbia Game Commission, Vancouver, B. C., Canada.

1. "The Effects of Logging Old-Growth Timber on Fish Management." Philip W. Schneider, Oregon State Game Commission, Salem, Ore.

2. "The Effects of Logging Old-Growth Timber on Big Game." Eric Huestis, Department of Lands and Forests, Edmonton, Alta., Canada.

3. "The Effects of Logging Old-Growth Timber on Rodent Control." Donald Spencer, U. S. Fish and Wildlife Service, Denver, Colo.

4. "The Effects of Logging Old-Growth Timber on Bear." J. Burton Lauckhart, Washington State Game Department, Seattle, Wash.

5. "The Effects of Wildlife on Timber Reproduction Following Logging of Old-Growth Timber." Casey E. Westell, Jr., American Box Board Company, Filer City, Mich.

6. "The Effects of Logging Old-Growth Timber on Sportsman-Landowner Relationships." Kramer Adams, Weyerhaeuser Timber Company, Tacoma, Wash.

Discussion.

Division of Forest Management

Wednesday, October 19

Myron B. Savage, Chairman
J. Walter Myers, Vice Chairman
Laurence K. Mays, Secretary

Morning Session
Management

1. "Is Forest Management a Part of Forest Economics — Or What Is It?" Kenneth P. Davis, School of Natural Resources, University of Michigan, Ann Arbor, Mich.

2. "The Practical Use of Management Plans in Initiating Sustained Yield Forestry." Wally G. Hughes, British Columbia Forest Service, Victoria, B. C., Canada.

3. "Converting Our Old-Growth Forests." Royce Cornelius, Weyerhaeuser Timber Company, Tacoma, Wash.

Discussion.

4. "Business Implications of Automation and the Need for Forest Management." James G. Rowbury, Scott Paper Company, Everett, Wash.

5. "Some Uses of Aerial Photos in the Management of Wild Land Areas." Robert N. Colwell, University of California, Berkeley, Calif.

Mensuration and Inventory

1. "Growth Inventory: A Valuable Part of Complete Forest Inventory." Earle R. Wilcox, Klamath Indian Agency, Ore.

2. "A Forest Growth Study." Paul Casamajor, Broadview Research and Development, Burlingame, Calif.

Discussion.

Afternoon Session
Forest Protection

Fire

1. "Old-Growth Conversion Also Converts Fireclimate." Clive M. Countryman, California Forest and Range Experiment Station, Berkeley, Calif.

2. "Protection of Old-Growth Douglas-fir Forests from Fire." Fred J. Sandoz, The Booth-Kelly Lumber Company, Springfield, Ore.

3. "Fire Control on Public Domain Lands in Alaska." Eugene V. Zumwalt, Bureau of Land Management, Anchorage, Alaska.

4. "Synopsis of Salvage Operations—Forks Fire of 1951." Mason B. Bruce, Olympic National Forest, Olympia, Wash.

Discussion.

Insects and Disease

1. "Cooperation Speeds Salvage of Windthrown and Beetle-Killed Timber in Oregon and Washington." W. D. Hagenstein, Industrial Forestry Association, Portland, Ore., and R. L. Furniss, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

2. "Color Photographs Useful in Evaluating Mortality of Douglas-fir." J. F. Wear, Pacific Northwest Forest and Range Experiment, Portland, Ore.

3. "Effects of Black-Headed Budworm Feeding on Second-Growth Western Hemlock and Sitka Spruce." William McCambridge, U. S. Forest Service, Juneau, Alaska.

4. Business Meeting.

Division of Forest Economics and Policy

Wednesday, October 19

Henry J. Vaux, Chairman
M. B. Dickerman, Vice Chairman
A. C. Worrell, Secretary

Morning Session

1. "Forest Resources in the Pacific Coast Economy." H. R. Josephson, U. S. Forest Service, Washington, D. C.

2. "Economic Effects of Integrated Utilization on Pacific Coast Forest Management."

a. "Recent Developments and Current Effects." Charles E. Young, Weyerhaeuser Timber Company, Tacoma, Wash.

b. "Integrated Utilization in British Columbia." Thomas G. Wright, Canadian Forest Products, Ltd., Vancouver, B. C., Canada.

c. "Implications for Future Development." John A. Zivnuska, School of Forestry, University of California, Berkeley, Calif.

3. "The Role of Public Forests in Economic Development of the Pacific Coast Region." G. Burton Wood, Department of Agricultural Economics, Oregon State College, Corvallis, Ore.

Comments. Edward P. Cliff, U. S. Forest Service, Washington, D. C. and Loran L. Stewart, Bohemia Lumber Company, Cottage Grove, Ore.

4. Business Meeting.

Division of Watershed Management

Wednesday, October 19

A. R. Croft, Chairman
E. A. Colman, Vice Chairman
W. E. Bullard, Secretary

Afternoon Session

1. Business Meeting.

2. "A Watershed Research Pro-

gram for the Northwest." E. G. Dunford, Pacific Northwest Forest and Range Experiment Station, Portland, Ore.

3. "Measurement and Management of Watershed Snow Packs." R. A. Work, Soil Conservation Service, Portland, Ore.

Discussion.

4. "Water Quality and Forest Management." C. M. Everts, Jr., Oregon State Board of Health, Portland, Ore.

Discussion.

5. Panel Discussion: "Minimizing Watershed Disturbance from Logging Operations."

Moderator: D. R. Gibney.

Participants: D. E. Colwell, Cascade Lumber Company, Yakima, Wash.

Lester Monerief, U. S. Forest Service, Ogden, Utah.

P. E. Packer, Intermountain Forest and Range Experiment Station, Missoula, Mont.

D. R. Hopkins, State Division of Forestry, Olympia, Wash.

E. A. Johnson, Coweeta Hydrologic Laboratory, Dillard, Ga.

Discussion.

Society Dinner

Wednesday, October 19

Robert W. Cowlin, Toastmaster

Address. Bernard L. Orell, Weyerhaeuser Sales Company, St. Paul, Minn.

Entertainment.

Field Trips

Five field trips have been arranged to show the highlights of city, state, federal, and industrial forest management in the Pacific Northwest.

Those attending the meeting are requested to make tentative, advanced reservations for these trips, especially for the trip on Sunday afternoon, October 16. The hotel reservation form on page 600 may be used.

Tickets for each trip will be put on sale during the meeting. The indicated cost for each trip is approximate.

Ladies are welcome on all field trips except the tour to the Tillamook Burn on Thursday, October 21.

Sunday, October 16

Portland City Forest.—This is a 5,200-acre forest within the City of Portland under the management of a resident forester. The trip will include visits to Hoyt Arboretum; panoramic views of the city and of Mt. Hood; and the Gallery of Trees housed in Portland's famous Forestry Building which contains remarkable historical exhibits of forestry and logging. A reception will be held in the Gallery of Trees from 2 p.m. to 5 p.m. Complimentary refreshments will be served.

Cost of the tour, $1. Ladies are invited.

Thursday, October 20

Industrial Tree Farm Tour.—Tree Farms in the Columbia River area between Portland and Astoria will be visited, and particularly the Columbia and Clatsop Tree Farms of the Crown Zellerbach Corporation. There will be an opportunity to see thinning operations of young Douglas-fir stands and logging methods. Logging of old-growth hemlock-spruce forests along the Pacific Ocean will show the modern, highly flexible logging equipment now commonly used in the Pacific Northwest. Plantations, fire protection measures, woods utilization, and growth of young stands will be seen.

Time: 8:30 a.m. to 8:30 p.m. Cost per person, $3 (including luncheon and dinner). Ladies are invited. Clothing should include rainwear, heavy shoes, and warm jackets.

Tillamook Burn Tour.—This tour will show work by the Oregon State Forestry Department to rehabilitate state-owned lands in the Tillamook Burn—an area of about 300,000 acres in Northwest Oregon that was burned three successive times by the disastrous fires of 1933, 1939, and 1945. This is probably the world's largest forest rehabilitation project. The Burn is being fireproofed by salvage logging, snag falling, and road building; reforestation is by planting and aerial seeding.

Time: 8:30 a.m. to 5:30 p.m. Cost per person, $2.75 (including luncheon). Open to men only. Clothing should include rainwear, heavy shoes, and warm jackets.

Friday, October 21

Mt. Hood National Forest Tour.—The Mt. Hood National Forest is close to the metropolitan Portland area. It contains 1,108,998 acres. The tour will visit the Clackamas Working Circle where modern forest practices and logging methods used in the Pacific Northwest can be seen. Timber sale procedures, access road development, and forest management policies of the U. S. Forest Service which are typical of problems on federal lands in the West will be viewed.

Time: 8:30 a.m. to 5 p.m. Cost per person, $3.50 (including luncheon). Ladies are invited. Clothing should include rainwear, heavy shoes, and warm jackets.

Forest Industries Tour.—This tour will visit the forest industries of Longview, Wash., the most integrated forest utilization center of the world. Here will be seen veneer and plywood manufacture, sawmilling, pulp and paper production, bark utilization, shingle and shakes manufacture, and pole and piling yards. Plants of the Weyerhaeuser Timber Company, Long-Bell Lumber Company, and Longview Fibre Company will be visited.

Time: 8:30 a.m. to 5:30 p.m. Cost per person, $2.25 (including luncheon). Ladies are invited. Clothing should be suitable to a mill tour. Raincoats should be taken.

Hotel Reservations

It is suggested that those expecting to attend the meeting arrive in Portland on Sunday, October 16, or not later than the morning of Monday, October 17. The open meetings start on Monday morning.

The Multnomah Hotel will be the headquarters hotel where most scheduled events will be held. Although the Multnomah contains 600 rooms, it will not be able to accommodate all those in attendance, hence other hotels are cooperating.

A special S.A.F. Housing Committee has been set up for the meeting, and all requests for room reservations should be addressed to this committee, as follows:

Housing Committee, Society of American Foresters; c/o Portland Chamber of Commerce; 824 S. W. Fifth Avenue; Portland 4, Oregon.

The reservation coupon printed herewith may be used. Subscribers who do not wish to cut the coupon from their JOURNALS may request reservations simply by providing the Housing Committee with all the information requested on the coupon.

Each reservation request should indicate first choice, second choice, and third choice hotels. As usual, single rooms may be scarce, hence when possible twin-bed rooms should be used.

There follows a list of cooperating hotels and their rates. All quoted rates are with bath unless otherwise noted. Some hotels have rooms with connecting baths at lower rates.

Hotels

Multnomah Hotel, S.W. Fourth Avenue and Pine Street. Single rooms, $6 to $8; double, $8 to $13; twin beds, $9 to $13. Sets of twin-bed rooms and double rooms connecting, for four peo-

ple, $15 to $16. Suites available.

Benson Hotel, S. W. Broadway at Oak Street. (Four blocks from the Multnomah.) Single, $6 to $10; double, $8 to $15; twin beds, $11.50 to $15.

Imperial Hotel, S. W. Broadway at Stark Street. (Five blocks from the Multnomah.) Single, $4 to $6; double, $6 to $8; twin beds, $7 to $9.

Congress Hotel, S. W. Sixth Avenue and Main Street. (Ten blocks from the Multnomah.) Single, $5.50 to $7; double, $6 to $8; twin beds, $7.50 to $8.50.

New Heathman Hotel, 712 S. W. Salmon Street. (Eleven blocks from the Multnomah.) Single, $6.50; double, $8; twin beds, $8.50.

In addition to the foregoing hotels, there are other smaller hotels within the downtown area. The Housing Committee will supply a list of these hotels with their addresses for those who request it.

Motels and motor courts are available outside the downtown area. Their rates for single rooms with bath are from $5.50 up; doubles are $6.50 and up. The Housing Committee will make motel reservations, or will furnish members with a list of motels for those who may wish to request their own reservations.

Meeting Committees

The general chairman for the meeting is J. Herbert Stone, U. S. Forest Service, 729 N. E. Oregon Street, Portland 8, Ore.

Assisting him are the following committees and their personnel.

Program Committee

The chairman of the Program Committee is W. F. McCulloch, School of Forestry, Oregon State College, Corvallis, Ore. The other members are K. G. Fensom, Roger Guernsey, Clare Hendee, and A. J. Sandoz.

Arrangements Committee

The chairman of the Committee on Arrangements is Clarence Richen, Crown Zellerbach Corp., 1400 Public Service Building, Portland, Ore.

Assisting him is Laurence C. Jolley, U. S. Forest Service, 729 N. E. Oregon Street, Portland 8, Ore.

Heading up special task committees are the following individuals:

Information and Publicity, Albert Arnst.

Hotel Reservations and Housing, Howard Roberts.

Registration and Welcome, Martin L. Syverson.

Exhibits, Arthur K. Roberts.

Field Trips, Nels Jeffers.

Ladies Entertainment, Mrs. Robert Conklin.

Meeting and Conference Rooms, Owen Cramer.

Annual Dinner Arrangements, Paul Vance.

Projection and Amplifying Equipment, Clyde Stratton.

"Sergeant-at-Arms," Louis Alexander.

Special Assignments, Robert D. Hostetter.

SOCIETY OF AMERICAN FORESTERS

ANNUAL MEETING

Portland, Oregon. October 16-19, 1955

....., 1955

Housing Committee, Society of American Foresters,
c/o Portland Chamber of Commerce,
824 S. W. Fifth Avenue,
Portland 4, Oregon.

First Choice Hotel .....
Second Choice Hotel .....
Third Choice Hotel .....

Please make a reservation for the following room accommodations for arrival on October ....., a.m. / p.m. Departure date, October .....

I understand that accommodations will be provided at the daily rate specified, if available; otherwise the next nearest rate will apply.

..... Single room with bath. Rate, $.....
..... Double-bed room with bath. Rate, $.....
..... Twin-bed room with bath. Rate, $.....
..... Suite (parlor, twin-bed room, and bath). Rate, $.....
..... Other. (Specify accommodations desired.).....
..... Rate, $.....

The above room accommodations are requested for the following persons, in addition to myself. (Print or typewrite names and addresses legibly.)

.....
.....
.....

My name: .....
Street address: .....
City, zone, state: .....

PRELIMINARY FIELD TRIP RESERVATIONS

Please make the following reservations for field trips. (Tickets to be purchased at the meeting.)

	Number of persons
Sunday, October 16; afternoon	
Portland City Forest	_____
Thursday, October 20; all day	
Industrial Tree Farms	_____
Tillamook Burn	_____
Friday, October 21; all day	
Mt. Hood National Forest	_____
Forest Industries of Longview	_____

Report of Council Meeting

A meeting of the Council was held at the Schafer Ranger Station in the Flathead National Forest, Montana, June 14 and 15, 1955.

Ten members, a quorum, were present: President E. L. Demmon, Vice President DeWitt Nelson, W. J. Brown, C. H. Coulter, S. G. Fontanna, P. D. Hanson, E. F. Heacox, J. S. Illick, J. H. Stone, and R. H. Westveld; together with Henry Clepper, executive secretary. D. B. Demeritt was unavoidably absent.

Forestry Re-Accredited at University of California

In January 1955 the Society of American Foresters in cooperation with the Western College Association made a re-examination of the University of California forestry curriculum for the purpose of accreditation.

In addition to a detailed questionnaire report submitted by the School of Forestry, an S.A.F. visiting committee consisting of Ernest Wohletz and John D. Coffman visited the Berkeley campus on January 10, 11, and 12 to make a personal inspection of the faculty, quarters and equipment, and other facilities.

On the basis of this visiting committee's report, plus the questionnaire data, the Society's Committee on the Advancement of Forestry Education[1] (F. H. Kaufert, C. M. Kaufman, E. R. Martell, and Ernest Wohletz, with Myron Krueger, chairman, abstaining) recommended to the Council that the University be continued on the Society's list of institutions accredited for professional forestry instruction.

On motion by Dr. Westveld, seconded by Mr. Fontanna, the Council voted unanimously to approve the recommendation of the Committee on the Advancement of Forestry Education.

Forest Science

As of May 31, 1955 the number of subscribers to *Forest Science* was 1,069.

On motion by Mr. Hanson, seconded by Mr. Nelson, the Council unanimously approved the opening of a checking account for the quarterly journal *Forest Science* in the Riggs National Bank, Washington, D. C., if it is deemed feasible to do so.

[1]Formerly the Committee on Accrediting.

MEMBERS OF THE COUNCIL who met at the Schafer Ranger Station, Flathead National Forest, Montana, June 14-15, 1955. *L* to *R*, Clepper, Heacox, Illick, Fontanna, Nelson, Brown, Demmon, Stone, Westveld, Coulter, Hanson.

TABLE 1.—THE SOCIETY'S DOLLAR

	1953	1954	Change
	Cents		
Where It Comes From			
JOURNAL Subscriptions and JOURNAL Sales	7.6	8.0	+ .4
Member Dues and Admission Fees	71.6	70.8	− .8
Advertising (gross income; not net)	19.5	18.8	− .7
All Other Income	1.3	2.4	+1.1
Total	100.0	100.0	
Where It Goes			
JOURNAL OF FORESTRY	56.8	55.5	−1.3
Services to the Council, Sections, Divisions, Committees[1]	5.1	7.0	+1.9
Professional and Technical Services[2]	2.2	5.0	+2.8
Professional and Public Relations[3]	2.7	2.9	+ .2
General Administration; Membership Services; Elections; Records[4]	33.2	29.6	−3.6
Total	100.0	100.0	

[1]These services include the collection of dues for the Sections; maintenance of the *Section Manual;* assistance, financial and otherwise, to the 11 subject Divisions in the conduct of their business and meetings; maintenance of rosters of Division and Section officers, and maintenance of permanent records of their activities.

[2]Professional and technical services include everything the Society does for the membership, individually and collectively. An important service is obtaining information for members not readily available elsewhere. The facilities of the Society are available to members for any appropriate purpose, and the number of such requests is increasing. The increase in this category for 1955 over 1954 was caused by the preparation of the *Forestry Handbook.*

[3]Professional and public relations include the many activities carried on for the purpose of disseminating information about the Society and the forestry profession. Cooperative relations with other scientific, professional, and technical organizations are maintained by participation in their activities and they in ours. Similar cooperative relations are maintained with trade organizations, conservation associations, and educational groups.

[4]As the name implies, general administrative services cover the housekeeping functions essential to the operation of the Society. These include many things, such as the processing of some 1,500 membership applications and advancements annually; maintaining membership records and addresses; conducting elections of the Council; and handling all business matters.

(Table 1.—Cont.) Costs per Member in 1954
(Based on average membership of 9,875)

JOURNAL OF FORESTRY	Council, Sections, Divisions, Committees	Professional and technical services	Professional and public relations	General adm. membership services, elections, records	Total
$6.76	$0.84	$0.62	$0.34	$3.60	$12.26

Income per Member in 1954
(Based on average membership of 9,875)

JOURNAL OF FORESTRY and sale of JOURNALS	Dues and Fees	Advertising	All Other	Total
$0.99	$8.99*	$2.40	$0.30	$12.68

*Also average payment per member.

TABLE 2.—1955 BUDGET

Income	
Dues	$ 90,000
Fee	1,800
Subscriptions & Sale of Jrls.	9,800
Advertising	25,000
Interest & Dividends	600
Miscellaneous Income	2,400
Total	$129,600
Expense	
JOURNAL OF FORESTRY	$ 42,500
Editor's Expense	500
Salaries, Editorial	11,042
Salary, Executive Secretary	10,000
Salaries, Office	29,060
Advertising Commission	9,000
Advertising Promotion & Expense	3,000
Travel, Officers	3,000
Postage	2,500
Telephone & Telegram	800
Rent	6,318
Mimeograph & Multigraph	600
Miscellaneous Printing	1,200
Office Supplies	1,500
General Expense	1,500
Depreciation	1,000
Retirement Plan	1,528
Retirement Plan, Reserve	585
Affiliation Dues	160
Committee Expense	50
Grading Forestry Schools	500
Council Travel Expense	1,500
Division Expense	50
Social Security Tax	875
Miscellaneous	200
Election of Officers & Fellows	600
Forest Service Dinner	100
Proceedings (1954)	600
Total	$130,268

On motion by Mr. Brown, seconded by Dr. Westveld, the editors of *Forest Science* were unanimously requested to prepare a budget for the 1956 fiscal year for the information of the Council at its October 1955 meeting.

Registration Fee for 1955 Annual Meeting

On motion by Mr. Brown, seconded by Mr. Coulter, the Council unanimously approved a registration fee of $5 for the 1955 annual meeting in Portland, Ore., October 16-19. This fee will be charged to all members and others attending as guests, excepting nonmember guests participating in the scheduled program, ladies, and forestry school students.

Each person paying the registration fee will receive a copy of the published *Proceedings* of the meeting.

Proceedings of 1955 Meeting

On motion by Mr. Heacox, seconded by Mr. Hanson, the Council unanimously authorized publication of the *Proceedings* of the annual meeting in Portland, Ore., October 16-19, 1955, in the same manner as the *Proceedings* for the 1954 meeting were published.

The cost of printing and mailing the 1954 *Proceedings* totalled $4,050 for 1,000 copies. As of May 31, 1955 sales totalled $3,493.

Society Income and Expense

At the request of President Demmon, Miss L. A. Warren, business manager, prepared a brief breakdown of Society income and expense. The data, shown in Table 1, is published herewith.

Audit and Budget

The report of the auditors, McGinley and McGinley of Washington, D. C., was received for the first half of the fiscal year (December 1, 1954-May 31, 1955). On motion by Dr. Illick, seconded by Mr. Brown, the Council unanimously accepted the report.

A special committee of the Council was appointed by President Demmon to review salary scales of Society employees. This committee consisted of Mr. Nelson, chairman, and Messrs. Demeritt and Hanson. Mr. Heacox and Mr. Stone participated.

The committee found some lack of balance between individual employees' salaries, and between the Society's clerical and secretarial staff as compared with similar federal wage scales. Salary increases for the clerical personnel (but not including Mr. Clepper, Mr. Meyer, and Miss Warren) were authorized by unanimous vote of the Council, on motion by Mr. Nelson, seconded by Mr. Hanson. It is the intent of the Council that Society salary scales shall be more in line with existing government pay for comparable jobs; and that a base rate of $2,500 shall be attained as rapidly as possible.

On motion by Mr. Nelson, seconded by Mr. Heacox, the Council unanimously authorized the President to appoint a special committee to study and analyze the work performed by the executive office, the organization needed, and the Society's existing personnel policy, and to report with recommendations to the Council in October 1955.

The 1955 budget, as revised and approved by the Council, on motion by Mr. Fontanna, seconded by Mr. Brown, is shown in Table 2.

Savings Account

Bylaw 64 reads as follows: "The funds of the Society shall be deposited in a bank, approved by the Council, or invested in federal securities. . . ."

Currently the Society has a savings account ($9,085 as of May 31, 1955) in a federal reserve bank which pays 2 percent interest per annum. This

rate is subject to change by the bank to such extent as may be necessary to comply with requirements of the Federal Reserve Board.

Building and loan associations are currently paying interest in excess of 2 percent—3, 3½, and in some associations, 4 percent. Interest rates are set annually by their board of directors, and continuing higher rates than in banks can be expected. In most building and loan associations safety of savings, up to $10,000, is insured by the Federal Savings and Loan Insurance Corporation.

On motion by Mr. Coulter, seconded by Mr. Hanson, the Council unanimously approved the deposit of Society funds in building and loan associations provided such deposits are fully insured by the Federal Savings and Loan Insurance Corporation.

Committee on Advancement of Forestry Education

On the recommendation of Myron Krueger, chairman of the Committee on the Advancement of Forestry Education (formerly the Committee on Accrediting), the Council went on record for appointments to this committee to be made on the basis of staggered terms. In the interest of continuity of policy and procedure, it is believed undesirable to make all new appointments in any one year.

On motion by Mr. Heacox, seconded by Dr. Illick, the Council unanimously recommends to future Councils that continuity in the personnel of this committee be instituted.

Committee on Tree Names

At the meeting in Milwaukee on October 24, 1954 the Council adopted a resolution that brought to the attention of appropriate bodies dealing with international botanical nomenclature the Society's belief that long established names of important trees should be retained. Specifically, the resolution requested that the name of Douglas-fir *Pseudotsuga taxifolia* be restored. (For detailed background regarding this matter, see the JOURNAL for January 1955, page 55; and for October 1954, pages 803-804.)

As a followup of correspondence with botanists representing bodies concerned with international nomenclature, the Society has been invited to cooperate by suggesting the names of species of outstanding economic importance that should be restored or retained. On motion by Mr. Nelson, seconded by Mr. Heacox, the Council unanimously authorized a special Committee on Tree Names to follow through with this invitation. The personnel of the committee is as follows:

Chairman, William A. Dayton, Forest Service, U. S. Department of Agriculture, Washington 25, D. C.

Henry I. Baldwin.
Keith Dorman.
John Duffield.
Philip G. Haddock.
Elbert L. Little, Jr.

A National Conference on Forestry Research

Among the recommendations in the book *Forestry and Related Research in North America*, soon to be published by the Society, is a proposal for a national conference on research. The specific recommendation follows:

> The nation must be made aware of the critical need for an expanded research program in all segments of the forestry and related fields. The expansion needed is of such proportions that the maximum effort of all interested public and private groups will be required. A nation-wide program of research stimulation and development is called for.
>
> It is recommended that following the publication of this report the Society of American Foresters invite the National Research Council, the National Academy of Sciences, the National Science Foundation, Resources for the Future, Inc., all professional and other societies concerned in the several subject matter fields, and other interested groups and agencies to join in sponsoring a national conference on forestry and related research. The purpose of the conference would be to formulate ways and means of effectuating the urgently needed research expansion. It is recommended that interested Canadian and Mexican groups be invited to participate.

On motion by Mr. Heacox, seconded by Mr. Brown, the Council unanimously authorized a Committee for a National Conference on Research, consisting of Henry Clepper, E. L. Demmon, and Frank H. Kaufert. The specific assignment of the committee is to explore the possibilities for such a conference and to arrange for it in 1956.

1958 Annual Meeting

According to the Society's long-established policy of scheduling annual meetings on a rotation system, the 1958 meeting is due for the Rocky Mountain region. An invitation to hold this meeting in Salt Lake City has been received from the Intermountain Section.

On motion by Mr. Fontanna, seconded by Mr. Coulter, the executive secretary was unanimously authorized to explore a suitable place and dates for the 1958 meeting in the Rocky Mountain area, particularly Salt Lake City, and report to the Council in October.

The 1955 annual meeting will be held in Portland, Ore., October 16-19; headquarters, Multnomah Hotel.

The 1956 meeting will be held in Memphis, Tenn., October 14-17; headquarters, Peabody Hotel.

The 1957 annual meeting will be held in Syracuse, N. Y., November 10-13; headquarters, Syracuse Hotel.

Joint Conference of Council and Section Delegates

Another joint conference of the Council and Section delegates will be held on Sunday evening, October 16, in the Multnomah Hotel, Portland, Ore. in connection with the Society's 1955 annual meeting.

This will not be an open conference. Primarily, it is to enable the Council and official Section representatives to discuss Society's affairs. Designated representatives of the Chapters will be welcome also.

The purpose of this conference, as determined by the Council, will be to explore ways and means whereby an important objective of the Society can be made more effective. This objective, as stated in Article II of the Constitution, is ". . . to represent, advance, and protect the interests and standards of the profession of forestry. . . ."

Subject Divisions

A perennial difficulty in arranging the programs of annual meetings is to find both time and adequate meeting rooms during a three-day period for a general session, a Society Affairs session, a banquet, and 11 subject Division meetings. Many members have made the comment that the problem lies in too many Divisions.

In order to bring this matter to a head, on motion by Mr. Heacox, seconded by Mr. Brown, the Council unanimously takes the position that Divisions based primarily on employment affiliations are contrary to the best interests of the Society and do not conform to Article XII of the Constitution.

In taking this action the Council is in no way opposed to separate sessions or meetings of groups representing special employment interests, such as the consulting foresters, extension foresters, forestry school executives, and private foresters.

TABLE 3.—LENGTH OF TERMS OF SECTION OFFICERS
(As of June 1, 1955)

Section	*Length of Term*	*Date Officers take Office*
Allegheny	One year.	February (at annual meeting).
Appalachian	Chairman and vice chairman, one year; secretary-treasurer, two years.	January (at annual meeting).
Central Rocky Mountain	One year.	June 1.
Central States	Chairman elected annually by automatic promotion of vice chairman; vice chairman, one year; secretary-treasurer, two years.	October (at annual meeting).
Columbia River	Two years.	July 1.
Gulf States	One year.	May (at annual meeting).
Inland Empire	One year.	May (at spring meeting).
Intermountain	Two years.	March or April (at annual meeting).
Kentucky-Tennessee	Chairman and vice chairman, one year; secretary-treasurer, three years.	November or December (at annual meeting).
New England	Two years.	February or March (at annual meeting).
New York	Chairman and vice chairman, two years; secretary-treasurer, three years.	January (at annual meeting).
Northern California	One year.	March 1 (unless elected at annual meeting).
Northern Rocky Mountain	One year.	At May meeting.
Ozark	One year.	July 1.
Puget Sound	One year.	July 1.
Southeastern	One year.	January (at annual meeting).
Southern California	One year.	July 1.
Southwestern	One year.	July 1.
Upper Mississippi Valley	Two years.	November 1.
Washington	One year.	May (installed at last meeting prior to July 1).
Wisconsin-Michigan	One year.	July 1.

History of Forestry

President Demmon reported to the Council on the activities and plans of the Committee on the History of Forestry (E. N. Munns, chairman).

A history of state forestry is now in preparation under the sponsorship of the Association of State Foresters, and the history of the first twenty-five years of the U. S. Forest Service is being compiled under the leadership of W. B. Greeley.

In view of these projects, and others that may be in preparation, it was the consensus of the Council that the Committee on the History of Forestry be asked to make a survey of what is being written on history, and then to determine specific areas wherein work needs to be done.

Combined Section News Letter

A combined news letter, illustrated and printed, for the Columbia River and Puget Sound Sections has been proposed, to be edited by Lloyd Thorpe of Seattle. A pilot edition will be issued in advance of the annual Society meeting in October in order to obtain the reaction of the members of the two Sections. The publication is expected to report on activities of the Sections and Chapters, including announcements and meeting notices, as well as news items of special interest.

On motion by Mr. Nelson, seconded by Mr. Heacox, the Council unanimously expressed the concensus that it is not opposed to an exploration trial of the combined news letter.

Terms of Section Officers

A year ago no two Sections began the terms of their Section officers on the same date. With the officers starting their terms on 21 different dates, considerable confusion existed in maintaining an up-to-date roster of Section officers. At the conference of the Council with the Section delegates at the 1954 annual meeting, it was suggested that in the interest of necessary uniformity the Sections attempt to change their procedure so that their officers would start their term of office either on January 1 or July 1.

Table 3 shows the dates that officers take office in each of the Sections, as of June 1, 1955. In three Sections the term begins in January; in six Sections in July.

On motion by Mr. Fontanna, seconded by Mr. Hanson, the Council unanimously recommends to the Sections that the terms of officers, particularly of secretary and chairman of the membership committee, be such as to provide more continuity and that the terms of elected officers start either January 1 or July 1.

Obviously, this motion does not apply to those Sections where the foregoing policy is already in practice.

Forestry Terminology

Two editions of *Forestry Terminology* have been published by the Society. The first was issued in 1944; the second in 1950. The latter printing will soon be exhausted.

A glossary of terms in forest genetics is now being compiled by a special committee of the Division of Silviculture. When ready, this glossary will be included in the third revised edition.

On motion by Dr. Westveld, seconded by Mr. Brown, the Council unanimously approved publication of a revised edition of *Forestry Terminology* in 1956 under a committee consisting of Henry Clepper and Arthur B. Meyer, editors; and Robert R. Blumenstein, Frances J. Flick, and Bruce J. Zobel, technical consultants.

Directory of Members

At its meeting June 13-15, 1954, the Council authorized an addition to the 1955 budget to finance a new directory of members. The latest directory was published in 1950.

In view of rising printing costs, and an estimate of at least $4,000 to publish the directory, final decision on its publication was subsequently postponed.

On motion by Mr. Brown, seconded by Mr. Stone, the Council unanimously instructed the executive secretary to publish the directory early in 1956 as a supplement to the JOURNAL OF FORESTRY, by a reduction in the JOURNAL budget if necessary.

The cost is estimated at about $4,500.

Forest Practices Bulletin

At the meeting of the Division of Silviculture in Milwaukee on October 26, 1954 the members present adopted a resolution recommending that the Council publish the report "A Decade of Development in Forest Practices, 1940-1950." (See the JOURNAL OF FORESTRY for January 1955, page 64). Kenneth P. Davis of the University of

Michigan is chairman of the committee that prepared the report.

Subsequently, Dr. Davis agreed to bring the material in the report up to date to cover the period 1940-1955. Accordingly, on motion by Mr. Fantanna, seconded by Mr. Coulter, the Council unanimously approved publication of the forest practices bulletin on its completion by Dr. Davis' committee.

Student Member Grade Denied Nonprofessional Students

Last spring the head of a two-year vocational school, the students of which do not pursue a forestry curriculum though on graduation some of them transfer to a professional curriculum and go on for a degree, requested the Council to establish a grade of "Student Affiliate" to which they might be eligible.

The intent of the present Student Member grade is to grant early affiliation to those who are definitely preparing for a professional career in forestry. The Council believes it would be impracticable to establish a form of student affiliation for students of applied forestry who are not earning credits toward a forestry degree and who, in fact, may not enter forestry at all.

Accordingly, on motion by Dr. Westveld, seconded by Mr. Coulter, the Council unanimously voted not to establish the grade of "Student Affiliate."

Elections to Membership

Joseph Paddock of Wilkes Barre, Pa., an Affiliate Member, was elected a Junior Member by unanimous vote of the Council, on the recommendation of the Council Committee on Membership, and on motion by Mr. Nelson, seconded by Mr. Hanson.

The following foreign foresters were elected as Honorary Members by unanimous vote of the Council, on the recommendation of the Committee on International Relations, and on motion by Dr. Westveld, seconded by Mr. Nelson:

Auguste Oudin, director of the National School of Forestry, Nancy, France; and inspector- general of the French Department of Forests and Waters.

Aldo Pavari, director of the Forest Experiment Station, Florence, Italy; president of the International Union of Forest Research Organizations.

Julio Riquelme Inda, president of the Mexican Forestry Society.

TABLE 4.—COMPARATIVE MEMBERSHIP
(As of June 30)

Grade	1954	1955	Increase Decrease
Student	721	777	+56
Junior	4,400	4,485	+85
Member	3,851	4,100	+249
Fellow	71	69	−2
Affiliate	527	588	+61
Associate	218	238	+20
Corresponding	64	67	+3
Honorary	15	15	0
Total	9,867	10,339	+472

TABLE 5.—MEMBERSHIP BY SECTIONS JUNE 30, 1955

Section	Rank	Total	Junior	Member	Fellow	Affiliate	Associate	Student
Allegheny	7	640	282	252	4	16	14	72
Appalachian	5	656	289	291	4	24	5	43
Central Rocky Mountain	14	259	88	137	—	6	4	24
Central States	6	392	191	141	1	12	8	39
Columbia River	2	974	483	385	5	51	16	34
Gulf States	4	777	378	244	2	79	18	56
Inland Emp.	17	218	105	81	2	8	5	17
Intermountain	19	198	74	99	—	4	1	20
Kentucky-Tennessee	20	209	89	105	—	9	6	—
New England	8	620	223	251	5	63	17	61
New York	10	431	142	202	5	17	20	45
Northern California	3	744	338	299	9	47	24	27
No. Rocky Mountain	18	238	99	98	—	7	4	30
Ozark	13	357	156	117	1	50	5	28
Puget Sound	9	600	251	228	5	55	11	50
Southeastern	1	1,065	594	329	2	44	20	76
Southern California	21	113	55	42	3	7	3	3
Southwestern	16	222	102	100	1	18	1	—
Upper Miss. Valley	11	413	161	156	3	17	14	62
Washington	15	261	53	167	12	1	28	—
Wis.-Michigan	12	670	253	265	2	48	12	90
No Section Affiliation[1]		200	78	111	3	5	2	—
Corresponding		67						
Honorary		15						
Total Membership		10,339	4,485	4,100	69	588	238	777

[1]Society members in U. S. and foreign countries who have requested that they not be designated as members of any section.

Eino Saari, head of the Department of Forestry, University of Helsinki, Finland.

Election of Fellows

A preliminary report was made by Dr. Illick, who had been requested by President Demmon to serve as chairman of a special Council committee to study the procedure for electing Fellows. The other committee members are Messrs. Brown and Fontanna.

It was the desire of the Council that this committee be continued, and report to the Council at the meeting in October 1955. It was further agreed that no change in the present system of electing Fellows could be put into effect prior to the regular biennial election of December 3, 1955 inasmuch as any change proposed would require amendment of the Bylaws, and possibly amendment of the Constitution which would require a referendum of the membership.

Unprofessional Conduct

The Council reviewed in detail the procedure for handling charges of unprofessional conduct. It was the consensus that no changes are needed at this time. However, the members desire that appropriate safeguards shall be taken to prevent confidential and official documents relating to cases of alleged violation of the Code of Ethics from falling into unauthorized hands.

Accordingly, on motion by Mr. Heacox, seconded by Mr. Brown, the Council unanimously went on record as requiring that all confidential files be sent to the executive office when a case is closed or at the end of a Council member's term of office.

Membership

President Demmon made a report on his individual activities during the past year and one-half to stimulate membership applications and reinstatements.

As of May 31, 1955 the total membership was 10,259 as compared with a total of 9,867 on May 31, 1954.

Additional membership statistics are shown in Tables 4 and 5.

New York Section Protests Remission of Dues

To stimulate reinstatement of Society membership the Council, at its meeting in Milwaukee on October 24, 1954, voted to remit the payment of back dues of any former member who applies for reinstatement during the period November 1, 1954-December 31, 1955. Thus a member whose membership was terminated for arrears in dues may apply for reinstatement without the payment of any arrears, provided he makes such application before the end of 1955.

The following letter, dated February 7, 1955, is self-explanatory:

Dear President Demmon:

At the meeting of the New York Section Executive Committee memorandum CS-65 of November 16, 1954, Subject: Remission of Dues, was discussed. Our committee is in rather complete disagreement with the action of the Council in this matter. Our feeling is that the increase in membership that may result from this action as an advantage is far outweighed by several disadvantages.

1. Members recently reinstated without the advantage of remission of dues have the right to feel that they were not given equal treatment.
2. A repetition of this action in the future could lead some members to take advantage of such action as a means of escaping dues payments or at least to delay such payments in anticipation of dues remission.
3. The cost of membership, although an important problem with some members, is not excessive when the advantages are considered and by comparison with other professional societies.
4. The action is not completely consistent with the professional characteristics of the Society.

I believe that this pretty much covers our attitude. We would urge that the Council not repeat the action taken.

Very sincerely yours,
Allen W. Bratton, *Chairman.*

The executive secretary was instructed by the Council to notify the New York Section that no repetition or extension of this action is contemplated.

Study of Forestry Education

The executive secretary reported on the status of the proposed study of forestry education, as authorized by the Council in September 1953. (See the JOURNAL OF FORESTRY for November 1953, page 848.)

A prospectus and a budget of $80,000 were prepared by the two-man committee appointed by the Council (Henry Clepper and Hardy L. Shirley). Requests for a grant to finance the study were submitted in turn to three national foundations without success. A revised budget has been prepared and another attempt will be made to obtain a grant from a foundation.

Citizens Committee on Natural Resources

An organization known as the Citizens Committee on Natural Resources has been incorporated in the District of Columbia "to advance conservation, restoration, and sound management of natural resources in the public interest." Formed for the express purpose of giving leading conservationists a voice in legislative matters affecting natural resources, the Committee is registering with Congress.

Ira N. Gabrielson is chairman. Other members of the executive committee are Dewey Anderson, C. R. Gutermuth, Anthony W. Smith, Spencer Smith, and Howard Zahniser.

At a meeting of the board of directors, Henry Clepper was invited to become an active member and director for a term expiring in 1959. Although membership is on an individual basis, Mr. Clepper sought the advice of the Council.

On motion by Mr. Brown, seconded by Mr. Fontanna, the Council unanimously advised Mr. Clepper not to participate. Accordingly, he declined the invitation with thanks.

Legislation

In the absence of a clearcut policy with respect to legislative matters before Congress, on motion by Mr. Stone, seconded by Mr. Heacock, the President was unanimously authorized to appoint a committee to study the policy the Council should follow in relation to national legislation affecting forestry, and to report at the meeting in October 1955.

Public Relations

In his own behalf and of other members, Mr. Coulter proposed that the Council draw on the experience of Society members who deal in public relations to help broaden public knowledge of the Society and the forestry profession.

On motion by Mr. Stone, seconded by Mr. Coulter, the Council authorized the President to request the Division of Public Relations to survey the devices used to publicize the Society and its work, with the general public, with the Society membership, and with prospective members; and to report to the Council at its meeting on October 16, 1955 the Division's findings and its recommendations for possible improvements.

Editorial Code

Arthur B. Meyer, editor of Society publications, has recommended that a statement of editorial policy, in the form of an editorial code, be formalized for the JOURNAL OF FORESTRY.

On motion by Mr. Coulter, seconded by Dr. Illick, the Council authorized appointment of a committee, selected from the editorial board, to draft an editorial code for the consideration of the Council at its meeting in October 1955.

Southeastern Section Bylaws

At the request of Jack T. May, chairman of the Southeastern Section, the Council was requested to approve the Section bylaws as amended by vote of the Section membership.

On motion by Mr. Nelson, seconded by Dr. Illick, the Council unanimously approved the amended bylaws.

Appreciation

By unanimous vote the Council expressed its appreciation to P. D. Hanson, regional forester, and to the various staff members of the regional office and the Flathead National Forest for the many courtesies extended the Council during its meeting.

Sixth Call for Council Nominations

All voting members are hereby notified that the regular biennial election will be held December 3, 1955. A president, vice president, and nine other members of the Council will be elected for the two-year term 1956-1957.

The present Council is listed in the box on page 596. Any or all of these incumbents may be renominated, provided they accept the nomination in writing.

President Demmon has announced that he will not be a candidate for re-election.

Membership on the Council is restricted by the Constitution to Members (formerly Senior Members) and Fellows. Any Member or Fellow is eligible to hold office who is in good standing and who accepts the nomination in writing and declares his willingness to serve if elected.

Each voter will have an opportunity to ballot on all candidates for office. Council members are elected in accordance with the system of proportional representation. The procedure of proportional representation will be explained in a later issue of the JOURNAL. It is the system by which the Society has been electing Council members for two decades.

Candidates for the office of president are voted on separately; the candidate who receives the highest vote is declared elected president, and the candidate who receives the next highest vote is declared elected vice president.

How Nominations Are Made

The Constitution (Article VIII, Section 2) states the conditions under which nominations are made by petition.

1. Each petition shall name but one candidate.

2. All candidates must be eligible to hold elective office.

3. A petition shall bear the signatures of at least ten voting members who at the time of signing the petition are eligible to vote in the coming election. (Eligible voting members are Junior Members, Members, and Fellows in good standing.)

4. A voting member may not sign more than one nominating petition for President or more than one nominating petition for a member of the Council. That is, he may sign two, but no more.

5. Petitions must be in the Society office by October 1, 1955.

The Society has no special form for submitting nominating petitions. They may be written as follows:

We, the undersigned voting members of the Society of American Foresters, hereby nominate John Doe, a Member (or Fellow), for the office of President (or member of the Council) for the two-year term 1956-1957.

All nominating petitions should be sent promptly to the Society office. The executive secretary will gladly provide information about nominating or election procedure.

Nominations Received

On the date this issue went to press the following nominations had been received.

For President

George B. Amidon, International Falls, Minn.

DeWitt Nelson, Sacramento, Calif. (Vice president, 1954-1955.)

For the Council

B. E. Allen, Savannah, Ga.

N. T. Barron, Franklin, Va.

Philip A. Briegleb, New Orleans, La.

Randolph M. Brown, St. Paul, Minn.

C. H. Coulter, Tallahassee, Fla. (Council member, 1954-1955.)

S. G. Fontanna, Ann Arbor, Mich. (Council member, 1954-1955.)

Paul M. Garrison, Bogalousa, La.

P. D. Hanson, Missoula, Mont. (Council member, 1954-1955.)

Verne L. Harper, Washington, D. C.

George B. Hartman, Ames, Iowa

Edwin F. Heacox, Tacoma, Wash. (Council member, 1954-1955.)

William P. House, Cresham, N. H.

Joseph S. Illick, Syracuse, N. Y. (Council member, 1954-1955.)

Edward N. Munns, Concord, Calif.

Albert D. Nutting, Augusta, Me.

Richard J. Preston, Raleigh, N. C.

J. Herbert Stone, Portland, Ore. (Council member, 1954-1955.)

Henry J. Vaux, Berkeley, Calif.

The Society's Constitution provides that there shall be at least two candidates presented for the office of President, and at least nine candidates for the Council. Inasmuch as this constitutional provision has now been met, the Nominating Committee will make no nominations of its own. Additional nominations from the voting membership will continue to be received up to the the closing date, October 1.

A. R. BOND, *Chairman*
Nominating Committee

Coming Events

Allegheny Section

The Allegheny Section of the S.A.F. will meet August 5-6 at the Fernow Experimental Forest, Elkins, W. Va.

Ozark Section

The Ozark Section summer meeting, August 12 and 13, will consist of a field trip to examine the planting of strip mined lands near Tulsa, Okla.

New England Section

The summer meeting will be held at Amherst, Mass., Sept. 7-8. Housing will be in one of the University dormitories.

American Forestry Association

The annual meeting of the American Forestry Association will be held October 3-6 at the George Washington Hotel, Jacksonville, Fla.

Central State Section Meeting

The annual meeting of the Central States Section will be held in Jasper, Indiana, October 6 and 7.

Nominations for Grade of Fellow Now Open

All Members (formerly Senior Members) and Fellows of the Society are hereby advised that nominations for the grade of Fellow are now open. The election of Fellows will be held at the time of the Society's regular biennial election, December 3, 1955.

As defined by the Constitution (Article III, Section 6), "Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Members and shall be engaged in forestry work at the time of their election."

Nominations by Petition

The procedure for placing Members in nomination for the grade of Fellow is by petition. The Society has no printed form for this purpose; the petition may be typewritten thus:

We, the undersigned Members and Fellows of the Society of American Foresters, hereby nominate ———— for election to the grade of Fellow in 1955.

(Continued on page 609)

No. 10 of a series featuring forestry practices, projects and products . . .

Idaho

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IDAHO stands proudly among the American timbered states, ranking fourth in the Nation in volume of sawtimber. New official statistics show a saw timber inventory approximating 90 billion bd. ft.

About one-third of Idaho is forested (central and northern parts), making it more widely forested than any other state of the Intermountain group.

Among the "Big Three" of Idaho industries, the forest products industry ranks second to agriculture,—ahead of mining. Forest industries employ more than half of all persons working in manufacturing industries.—Thus, Idahoans count heavily upon their renewable forests for an even more abundant future.

Idaho's forests are mainly evergreen. The most valuable species is Idaho white pine, the official State tree. White pine is the elite of commercial woods because of its straight grain, soft and even texture, and workability. Other valuable woods are ponderosa pine, Douglas fir, western red cedar, white fir, western hemlock, western larch, and Engelmann spruce.

Largest tree is the Jordan tree, named after ex-Governor Len Jordan. This huge cedar, located in the Floodwood State Forest, measures over 16 ft. in diameter breast high.

Lumber is king among Idaho's forest products and the annual cut is about 1 billion bd. ft.,—enough to build 100,000 five-room dwellings! Other important products are cedar poles, paper, veneer and plywood, mine timbers, and railroad ties.

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Remember these simple rules:

1. A petition may not name more than one candidate.

2. It must be signed by 25 Members or Fellows in good standing.

3. It should be accompanied by a factual, not eulogistic, biographical sketch of at least 200 words giving an account of the nominee's professional career and accomplishments.

4. It must be received in the executive office of the Society in Washington, D. C., not later than October 1, 1955.

The executive employees of the Society cannot be responsible for obtaining signatures on partially completed petitions or on petitions incomplete by reason of unacceptable signatures (that is, signatures of other than Members and Fellows in good standing).

Nominations Received

On the date of going to press, the following Members had been nominated for the grade of Fellow:

Dwight B. Demeritt, Bangor, Me.
Samuel B. Detwiler, Boulder, Colo.
James F. Dubuar, Wanakena, N. Y.
Stanley G. Fontanna, Ann Arbor, Mich.
Bernard Frank, Washington, D. C.
Charles G. Geltz, Gainesville, Fla.
S. R. Gevorkiantz, St. Paul, Minn.
J. Alfred Hall, Madison, Wis.
Willard R. Hine, Atlanta, Ga.
Julius V. Hofmann, Raleigh, N. C.
Frank H. Kaufert, St. Paul, Minn.
F. Paul Keen, Berkeley, Calif.
Nicholas T. Mirov, Berkeley, Calif.
Clarence W. Richen, Portland, Ore.
T. Schantz-Hansen, Cloquet, Minn.
Arthur T. Upson, Tucson, Ariz.
Philip C. Wakeley, New Orleans, La.
R. H. Westveld, Columbia, Mo.

Election Procedure

Fellows are not elected by the membership at large, but by a board of electors which consists of all present Fellows and the present Council. (A Council member who is also a Fellow has but one vote.)

To win election a candidate must receive an affirmative vote of not less than one-half the total votes cast.

Significance of the Grade

The highest membership distinction that can be conferred by the Society, this grade is awarded in recognition of outstanding achievement. Fellows do not pay increased dues; their dues are the same as those of Members.

Since the Society was founded in 1900, there have been 100 Fellows elected. At the present time the number of living Fellows is 69.

List of Fellows

The current roster of Fellows follows. The state in which each Fellow is domiciled and the year of his election are shown after his name.

Allen, Shirley W. Michigan. 1948.

Baker, Frederick S. California. 1949.
Besley, Fred W. Maryland. 1940.
Brundage, Frederick H. Oregon. 1949.
Butler, Ovid. Maryland. 1940.

Carter, E. E. District of Columbia. 1942.
Chapman, Herman H. Connecticut. 1922.
Clapp, Earle H. District of Columbia. 1930.
Clepper, Henry E. Virginia. 1949.
Coffman, John D. California. 1946.
Cox, William T. Minnesota. 1953.
Curran, Hugh. Venezuela. 1951.

Damtoft, Walter J. North Carolina. 1951.
Dana, Samuel T. Michigan. 1935.
Demmon, Elwood L. North Carolina. 1951.
Drake, George L. Washington. 1953.

Eldredge, Inman F. Louisiana. 1942.
Evans, Charles F. Georgia. 1949.
Evenden, J. C. Idaho. 1953.

Ferguson, J. A. Pennsylvania. 1949.
Fischer, Arthur F. California. 1940.
Fritz, Emanuel. California. 1951.
Frothingham, E. H. California. 1942.

Garratt, George A. Connecticut. 1953.
Gill, Tom. District of Columbia. 1948.
Granger, Christopher M. Maryland. 1946.
Greeley, William B. Washington. 1918.
Guise, Cedric H. New York. 1951.
Guthrie, John D. Virginia. 1942.

Hall, William L. Arkansas. 1940.
Hartley, Carl P. Maryland. 1949.
Hawes, Austin F. Connecticut. 1939.
Hawley, Ralph C. Connecticut. 1942.
Heintzleman, B. Frank. Alaska. 1951.
Holmes, J. S. North Carolina. 1939.
Hosmer, Ralph S. New York. 1932.
Hunt, George M. Wisconsin. 1951.

Illick, Joseph S. New York. 1946.
Isaac, Leo A. Oregon. 1953.

Jeffers, Dwight S. Oregon. 1948.

Kelley, E. W. California. 1949.
Kellogg, Royal S. Florida. 1949.
Kinney, Jay P. New York. 1942.
Kittredge, Joseph. California. 1953.
Korstian, Clarence F. North Carolina. 1942.
Krueger, Myron E. California. 1951.

Lowdermilk, Walter C. California. 1948.

MacDonald, G. B. Iowa. 1944.
Marsh, Raymond E. District of Columbia. 1948.
Martin, Clyde S. Washington. 1948.
Mason, David T. Oregon. 1948.
McArdle, Richard E. District of Columbia. 1953.
Metcalf, Woodbridge. California. 1953.
Morrell, Fred W. Virginia. 1951.
Mulford, Walter. California. 1939.
Munger, Thornton T. Oregon. 1946.
Munns, Edward N. California. 1949.

Preston, John F. District of Columbia. 1948.
Price, Jay H. Arizona. 1951.

Schmitz, Henry. Washington. 1940.
Shirley, Hardy L. New York. 1951.
Show, S. B. California. 1948.
Siecke, E. O. Texas. 1946.
Sparhawk, William N. New Hampshire. 1946.

Watts, Lyle F. Oregon. 1946.
Winslow, C. P. Washington. 1942.
Wirt, George H. Pennsylvania. 1948.

Ziegler, E. A. Pennsylvania. 1949.
Zon, Raphael. Minnesota. 1918.

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The President's Column

Multiple use is a term often applied when considering the objectives of forest management. It means the coordinated and balanced use of the forest for two or more beneficial products and services, including production of wood and other timber products, grazing for livestock, food and cover for wildlife, water yields and protection of watersheds, and recreation and inspirational values. This does not necessarily imply the combination of all of these uses on every acre of forest land. As a rule, one of these uses will be the primary one, depending on the suitability of the land for that purpose, or the wishes of the owner; other uses may be present but are subordinate to, and may even conflict with, the dominant use.

On public lands the multiple-use objective is to obtain the optimum combination of uses for society as a whole. On privately owned forest lands, timber production will usually be the dominant use, with other uses and services necessarily being fitted in where possible without undue interference with the primary purpose. This may mean that on public lands recreation, wildlife production, and livestock grazing will be given a more prominent part than they would on privately owned forest lands. Watershed protection should be a prime objective on both public and private lands.

Multiple use as a basic principle underlying good forest management is essentially sound. However, it is not simple to apply. Its proper application to either public or private forest land is a challenge to foresters. There is undoubtedly need for special emphasis in existing courses in forestry schools on the principles and application of multiple use to forest lands, so that foresters will be better prepared to determine the relative importance or value of each land use. Even then conflicts will arise between different groups of users, including the public, that must be harmonized. Also, some flexibility is desirable, as changes in use may be necessary from time to time. All this points to the need for intensive study of land capabilities as well as of future needs for the various services rendered by the forest.

As the various uses of the forest have become better recognized, so too have professional foresters tended to become specialized in one or more of these forestry fields, through their training at school and by their professional experience. Whereas 50 years ago forestry schools offered but one general forestry curriculum stressing wood production, now they are providing opportunities to specialize in such fields as timber management, range management, wildlife management, watershed management, forest pathology, forest entomology, forest products or utilization, forest recreation, and even in natural resource conservation. And some of these specializations are offered by schools not connected with forestry.

Our Society likewise has become more specialized and has set up 11 subject-matter divisions the better to serve particular interests of the mem-

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FORESTRY and RELATED RESEARCH in NORTH AMERICA

Prepared by Frank H. Kaufert, Project Director, and William H. Cummings, Project Forester, for the Society of American Foresters Forestry Research Project.

Financed by a grant from the Rockefeller Foundation, the study was made under the general supervision of a steering committee of the Society of American Foresters and the National Research Council. *Forestry and Related Research in North America* is the result of a reappraisal of the existing structure of forestry and related research programs in North America, and includes recommendations and goals for the next quarter-century.

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Mettler's Woods

John F. Shanklin, chairman of the Society's Committee on Natural Areas, has announced that the Committee has received a check for $75,000 from the United Brotherhood of Carpenters and Joiners of America, AFL, to help in the campaign to preserve Mettler's Woods in New Jersey as a Natural Area.

With the receipt of this check, the original goal of the Committee has been exceeded by $32,500, thus making available a larger capital fund for maintaining and operating the tract. The Natural Area will be preserved and maintained by Rutgers University.

Previous accounts of the progress of this campaign appeared in the April 1954 (page 283) and March 1955 (page 223) issues of the JOURNAL OF FORESTRY.

bers in the following: Education, Forest Economics and Policy, Forest Management, Forest-Wildlife Management, Private Forestry, Public Relations, Range Management, Forest Products, Forest Recreation, Silviculture, and Watershed Management. Yet it has been decided by referendum that Junior membership requirements should be such that graduates of accredited forestry schools must also have had a minimum (at least 3 quarter-credits each) of approved basic forestry courses in silviculture, forest management, forest protection, forest economics, and wood utilization.

There is no doubt that specialization will continue and intensify in the field of forestry. But if we are to consider ourselves as a forestry profession, few can disagree with the qualifications set up for acquiring full professional status in the Society. Membership in the Society is open to all men in the specialized forestry fields, either as Affiliate or Associate members. No matter how highly they become specialized, these men should consider our Society as a meeting ground for everyone working in forestry and allied fields. These specialists, if not eligible for Junior or full membership, can usually qualify for Affiliate or Associate membership, and may later come in as full professional members when by training and experience they have attained the basic qualifications. These men may be members of societies representing such fields as range management, ecology, soil conservation, wildlife management, or forest products, but the Society of American Foresters is the only one of this group requiring professional qualifications for full membership.

More and more, foresters will be confronted with problems arising from the multiple-use principles of forest management. We will be working with men trained in fields closely allied with ours. Let us, therefore, as professional foresters welcome into our Society any qualified person working in these fields. It is difficult for me to understand how specialists in forest products, range, recreation, water, or wildlife can fail to keep in close touch with developments in the broad profession of forestry through the JOURNAL OF FORESTRY and FOREST SCIENCE, and by joining foresters at their local, regional, and national meetings to discuss problems of mutual interest. The welcome mat is always out to these workers in fields allied to forestry, and we urge them to join our Society.

E. L. Demmon

Northern California Section Meeting

White fir, long the neglected orphan of western lumbering, is on its way up in lumber markets. So declared E. P. Ivory, president of Ivory Pine Company of California, at the banquet opening the 1955 field meeting of the Northern California Section.

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OUTGOING Gulf States Section chairman, J. B. Bryan (center), Wiggins, Miss., congratulates new chairman, R. M. Townsend, Jasper, Texas, and new secretary-treasurer C. Harvey Sprott (left). Outgoing vice chairman Richard C. Allen, Philadelphia, Miss. and outgoing secretary-treasurer J. S. Therrell, Starkville, Miss. are on right.

and marketing of white fir at the June 3 banquet, some 115 members and guests inspected timber harvesting and forest planting June 4 on a tour of industrial and national-forest operations in Calaveras County.

White fir owes its market advance, Mr. Ivory said, primarily to being well manufactured and properly seasoned. Drying makes the most of its weight and strength properties, which compare well with those of other western species, and it removes all traces of the green timber's disagreeable odor. Manufacturing and laminating are two other practices he recommended as helpful in expanding markets for white fir, which makes up the bulk of his company's production.

To improve the market position of white fir, Ivory, who is chairman of the northern California Forest Products Research Society, suggested greater research in several fields, including chipping low grade and cull logs in the woods, seasoning of exceptionally wet timber, and use of sawdust and shavings for by-products such as compost and wood flour.

The June 4 field tour started at the sawmill of Winton Lumber Company at Martell, where the group watched a mechanical barker clean off logs so that bark-free slabs could be made into pulp chips. Debarking also makes lumber manufacturing more efficient by giving sawyers a better view of the wood in logs.

From the mill, the trip covered woods operations of Winton Lumber Company, Associated Lumber and Box Company, Blagen Lumber Company, and Calaveras Land and Timber Company. Timber marking practices inspected on these properties included leaving all trees smaller than specified minimum diameters as well as light and heavy selection cuts.

In a burned-over area, the foresters saw trial plantings being made by

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OHIO CHAPTER of Central States Section, Society of American Foresters, gathered for their summer meeting at Old Man's Cave Park, June 5. After a business meeting and lunch with their families, members inspected nearby forestry projects.

Photo Ohio Forestry Association

Associated and Blagen with several species of trees. Fire had not done well on this exposed site, but 80 to 90 percent of the planted pines had made good growth in their first two years.

On the Stanislaus National Forest, the group saw a planting trial in a cutover area with a dense ground cover of mountain-misery, a low growing shrub. Trees highly susceptible to insect attack had been harvested on this area. Strips of ground were cleared by disking the dense mat of brush, and pines were planted in the cleared strip this spring.

K. M. Macdonald, of Woodleaf, newly elected chairman of the Section, presided at the field meeting. Other new officers are Don Knowlton, Nevada City, vice chairman; Sam Bryan, Mokelumne Hill, treasurer; and Don Cosens, Strawberry Valley, secretary.

Bryan was chairman of the program committee for the field meeting, and he was assisted by Warren Carleton, of Martell, and William H. Kuphaldt, of White Pine.

CLYDE M. WALKER,
Editor, Northern California Section,
Society of American Foresters.

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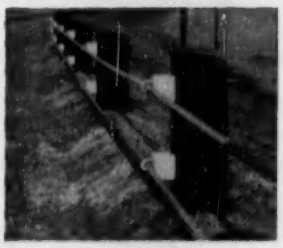

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Gulf States Section Meeting

The annual spring meeting of the Gulf States Section was held at the Buena Vista Hotel, Biloxi, Miss., May 26 and 27. Nearly 400 members, their ladies, and guests were in attendance.

On the afternoon of the first day, sail boat and power boat trips were available for tours of the harbor and the nearby coastal islands of the Gulf. During the evening recent forestry motion pictures were shown.

Dr. Irvin P. Krick, president of the Water Resources Development Corporation of Denver, opened the technical sessions with a paper "The Application of Weather Modification Techniques to Forestry Problems."

"Soil Moisture and Tree Growth" was discussed by Robert Zahner of the Southern Forest Experiment Station.

"Chemical Control of Undesirable Hardwoods" was a paper by W. T. Thompson of Thompson Chemical Corp., St. Louis.

J. F. Coyne of the federal Forest Insect Laboratory, Gulfport, Miss. reported on forest insect problems of the deep South.

A panel discussion on the use of IBM punch cards was participated in by T. E. Bercaw and H. O. Davis of Gaylord Container Corp.; O. W. Brackman of the Flintkote Corp.; and by T. E. McGaha and Thomas Spain of International Business Machines Company.

At the Section's business meeting, at which Chairman James Bryan presided, President E. L. Demmon and Executive Secretary Henry Clepper reported on Society affairs. New officers were elected and installed as follows:

Chairman, Richard M. Townsend, Southwestern Settlement and Development Corporation, Jasper, Texas.

Vice chairman, Don B. Austin, 205 E. Collins, Henderson, Texas.

Secretary-treasurer, Charles H. Sprott, P. O. Box 149, Lufkin, Texas.

At the Section's dinner—a seafood jamboree—I. F. Eldredge served as toastmaster. The guest speaker was the Hon. J. Boyce Holleman of Mississippi.

Special activities and programs were arranged for the ladies of whom more than a hundred were present.

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Yes—IT'S TRUE that 4 Nelson quarts are more economical than the cheapest paints you can buy by the gallon. Quality in paint as in other things—not only pays for itself but saves—because—you use less and you save time, the most important factor costwise. Prove this for yourself—Send your order today or write for free bulletin and prices, Dept. JF.
THE NELSON COMPANY Iron Mountain, Mich.

Intermountain Section Resolution Commends Forest Service

The Intermountain Section of the Society of American Foresters in the year which marks the 50th anniversary of the U. S. Forest Service commended that service with the following:

RESOLUTION

WHEREAS, The United States Forest Service completed a half-century of service in the Department of Agriculture on February 1, 1955; and

WHEREAS, It has continuously furthered forestry leadership and cooperative protection and management of forest resources in the United States; and

WHEREAS, It has made great strides in research and the application of the science and philosophy of sustained-yield, multiple-use management of watershed, range, timber, wildlife and recreational resources of the national forests; and

WHEREAS, It has demonstrated that forest resources can serve "The greatest good of the greatest number in the long run."

NOW, THEREFORE, BE IT RESOLVED, That the Intermountain Section of the Society of American Foresters take the opportunity afforded by this spring meeting, April 1st and 2nd, at Boise, Idaho, to congratulate and commend the United States Forest Service for a half-century of distinguished attainment in the Service of the American people, through professional stewardship of the national forest resources and leadership and devotion to the cause of better forestry in America.

BE IT FURTHER RESOLVED, That a copy of this resolution be sent to the Chief of the Forest Service, the Editor of the JOURNAL OF FORESTRY, and to the Secretary of Agriculture for their information.

Law Passed in Michigan for Registration of Foresters

On May 26, Governor G. Mennen Williams signed a bill to register foresters in Michigan. The act represented the culmination of three years of work on the part of the Lower Michigan Chapter and the Hiawatha Chapter of the Wisconsin-Michigan Section, Society of American Foresters.

The law provides for the registration and regulation of foresters. It creates a state board of registration for foresters, authorizes the collection of fees, and provides penalties for violation of the act.

The term "forester" is defined by the act as "a person who, by reason of his knowledge of the natural sciences, mathematics, and the principles of forestry, acquired by forestry education . . . and/or practical experience, is qualified to engage in the practice of forestry. . . ." The board of registration will consist of five foresters appointed by the governor.

Michigan thus becomes the second state—Georgia was the first—to enact a law for the registration of foresters.

Membership Applications and Advancements

Proposals for admission, advancement, and reinstatements received in the Society office during the month of June are listed below.

Action on the eligibility of those proposed for membership as listed below will be taken by the Council as of September 1, 1955. Communications from voting members regarding the membership eligibility of these persons should be received in the Society office prior to that date.

Allegheny Section

Student Grade

PENNSYLVANIA STATE UNIVERSITY

McNeal, L. J. — Welch, R. L.

Junior Grade

PENNSYLVANIA STATE UNIVERSITY

Students Eligible for Automatic Advancement

Anderson, J. J.	Kane, J. T.
Beers, T. W.	Marquis, D. A.
Bobb, G. N.	McNaney, J. J.
Clepper, A. L.	Melvin, N. D.
Danniston, J. H.	Nagy, G. J.
Drake, D. G.	Nicholls, C. S.
Finkbeiner, J. M.	Perdos, T. S.
Foster, R. A.	Schmerts, E. A.
Frederick, L. W.	Snoich, R. S.
Harper, R. L.	Tanski, J. P.
Hobbs, R. J.	Tyson, K. L.
Horn, K. D.	Webb, T. S.
Hough, W. A.	Yelnosky, G.
Hudick, J. F.	Zylinski, J.

WEST VIRGINIA UNIVERSITY

Andre, J. E.	McGovern, J. P.
Bishop, D. D.	Phares, R. E.
Cassell, G. R.	Waite, T. M.
Jorishie, L. K.	Weller, D. G.
Kautz, W. W.	Wells, J. H.
Kessel, L. H.	White, J. B.
McElwee, R. M.	Wilson, G. N.

Appalachian Section

Junior Grade

Drake, R. B., Asst. Forester, Bonnie Doone Plantation, Ritter, S. C.; Univ. of Mass., B.S.F., 1952.

Gnann, J. W., Dist. Forester, Union Bag & Paper Corp., Ridgeland, S. C. Reinstatement.

Mills, W. H., Area Mgr., Riegel Woodlands Corp., New Bern, N. C.; W. Va. Univ., B.S.F., 1951.

DUKE UNIVERSITY

Students Eligible for Automatic Advancement

Olinger, H. L. — Whitaker, H. F.

NORTH CAROLINA STATE COLLEGE

Archer, J. M.	Hill, N. E.
Brown, J. B.	Lankford, R. B.
Chapman, J. F.	Larkey, B. J.
Dallery, E. L.	Manucy, O. A.
Frazier, T. R.	Robinson, J. F.
Hardy, P. L.	Takel, J. E.

Central Rocky Mountain Section

Junior Grade

Croxton, R. J., Dendrician, Marshall's Nursery, Denver, Colo. Reinstatement.

Central States Section

Student Grade

PURDUE UNIVERSITY

Hunt, J. T.

Junior Grade

PURDUE UNIVERSITY

Students Eligible for Automatic Advancement

Cottrell, R. L.	McGlone, J. V.
Gemmer, T. V.	Mead, M. F.
Hochwalt, N. C.	Swain, D. B.
Hoerbert, W. L.	Warne, M. R.
Huston, S. L.	Wilber, R. E.
Macko, B. A.	Wolter, J. C.

Columbia River Section

Student Grade

OREGON STATE COLLEGE

Burks, J. E.	Philbrook, M. E.
Carlson, A. D.	Scheuner, W. H.
Cone, J. B.	Warner, J. J.
McDonald, T. C.	

Junior Grade

Gross, D. C., Forester, Bur. of Land Mgmt., Roseburg, Ore. Reinstatement.

Nishitani, W., Buyer, McCormick Piling & Lbr. Co., Portland, Ore.; Univ. of Wash., B.S.F., 1947.

Thomas, G. M., Entomologist, Pacific Northwest Forest & Rge. Expt. Sta., Portland, Ore.; State Univ. of N. Y., B.S.F., 1951.

OREGON STATE COLLEGE

Students Eligible for Automatic Advancement

Barrows, D. B.	McCredie, W. H.
Brady, L. J.	Parks, G. K.
Davis, J. W.	Patchen, G. N.
Erickson, J. R.	Rosette, M. S.
Heuschkel, D. G.	Spray, R. H.
Hickman, A. R.	Westrate, C. G.
Hopkins, H. K.	Winjum, J. K.
Johnson, N. E.	

Member Grade

Gervais, I. W., 1216 E. Main St., Medford, Ore.; Ore. State, B.S.F., 1945. (Junior, 1946).

Poirier, S. S., P. O. Box 187, Oakridge, Ore. Reinstatement.

Affiliate Grade

Baldridge, H. E., Mgr. Timber Lands, Publishers Paper Co., Portland, Ore.

Gulf States Section

Junior Grade

LOUISIANA POLYTECHNIC INSTITUTE

Students Eligible for Automatic Advancement

Bryan, R. W.	Keith, J. G.
Edmondson, J. H.	Woodman, D. H.
Essmeier, D. L.	

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LOUISIANA STATE UNIVERSITY

Allee, R. S.	Lewis, A. D.
Barrett, R. E.	McDaniel, O.
Bowers, J. W.	Simmons, C. D.
Cabaniss, G. W.	Slade, W. L.
Dark, B. R.	Webb, J. S.
LaFosse, H. L.	

Member Grade

Switzer, G. L., Asst. Prof., Miss. State College, State College, Miss.; W. Va. Univ., B.S.F., 1949; Yale, M.F., 1950. (Junior, 1950).

Affiliate Grade

Chaffin, J. W., Grad. Student, Okla. A & M College, Hattiesburg, Miss.; Okla. A & M, B.S., (Forestry), 1954.

Inland Empire Section

Student Grade

UNIVERSITY OF IDAHO
Baldwin, R. R.

Junior Grade

Berry, V. H., Woodland Specialist, Soil Cons. Service, Spokane, Wash.; Univ. of Wash., B.S.F., 1948.

Colwell, B. E., 501 N. 12th Street, Coeur D'Alene, Idaho; Univ. of Idaho, B.S.F., 1950.

Evans, S. S., Box 241, Orofino, Idaho. Reinstatement.

UNIVERSITY OF IDAHO
Students Eligible for Automatic Advancement

Carlman, R. A.	Newell, M. E.
Clason, J. P.	Olson, J. D.
Elfering, L. C.	Ottenfield, B. B.
Finch, S. J.	Sandmeyer, J. D.
Klason, R. P.	Vara, H. T.
Miller, R. A.	Wallace, W. B.

Affiliate Grade

Graham, W. G., Forester, U.S.F.S., Priest River, Idaho; Wash. State, B.S., (Forestry), 1955.

Intermountain Section

Junior Grade

Mitchell, Y. A., Forester, Caldwell Lbr. Co., Boise, Idaho. Reinstatement.

UTAH STATE AGRICULTURAL COLLEGE
Students Eligible for Automatic Advancement

Coghill, W. S.	Wheeler, R. A.
Wardleigh, R. D.	

Kentucky-Tennessee Section

Associate Grade

Robert, S. A., Director, Agric. & Forestry, Gulf, Mobile & Ohio R. R. Co., Jackson, Tenn.; Miss. State, B.S., (Agric.), 1903.

New England Section

Junior Grade

UNIVERSITY OF MAINE
Students Eligible for Automatic Advancement

Bowman, P. C.	Huntress, P. A.
Hodgkins, C. B.	Weatherbee, R. L.

UNIVERSITY OF MASSACHUSETTS

Curtis, J. R.	Massachi, J. E.
Gatchell, C. J.	Putnam, R. D.
Halloran, D. W.	Shenk, W. D.
Harrison, A.	Willard, R. E.
Henry, R. F.	

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Timber Production
Forest Products Marketing
HAWLEY PENNSYLVANIA

YALE UNIVERSITY

Davenport, J. A. — Scotton, F. A.
Finlay, G. — Steinhoff, R. G.
Hilse, A. D. — Sunderland, L. B.
Hollingsworth, S. — Twining, G. E.
Mahoney, H. B. — Watson, D. A.
Rock, D. A. — White, M. C.

Affiliate Grade

Calhoun, J. C., Mgr.-Forester, Timber Owners of New England, Inc., Surry, N. H.; Yale, M.S., (Cons. & Forestry), 1952.

New York Section

Student Grade

STATE UNIVERSITY OF NEW YORK

Allen, G. E. — Smith, H. W.

Junior Grade

Stiell, W. M., Forest Eng., Federal Forestry Branch, Ottawa, Ont., Canada; State Univ. of N. Y., M.S., 1955.

STATE UNIVERSITY OF NEW YORK

Students Eligible for Automatic Advancement

Bernhardt, R. W. — Kaulfuss, W. J.
Brewer, J. E. — Kratzenstein, W. C.
Burgess, G. H. — Longtine, R. C.
Burnett, H. W. — Luche, T. C.
Colassard, B. S. — Meyer, D.
Combs, J. C. — Morse, J. E.
Deepers, W. C. — Morse, P. E.
Eastbury, P. O. — Pratt, F. D.
Frank, E. C. — Schultz, D. A.
Fritch, D. R. — Serino, R. G.
Harding, A. J. R. — Van Husen, C. M.
Hovey, S. T.

Northern California Section

Student Grade

UNIVERSITY OF CALIFORNIA

Clark, K. P.

Junior Grade

Rotto, M. A., 378th Ord. Co., Camp Irwin, Calif.; Univ. of Calif., B.S.F., 1954

UNIVERSITY OF CALIFORNIA

Students Eligible for Automatic Advancement

Annand, P. G. — Laursen, V. R.
Biddison, D. L. — Miller, H. R.
Colby, J. G. — Rusk, J.
Emlen, W. M. — Sanguinetti, D. J.
Harris, A. S. — Shiro, J. H.
Harrison, J. W. — Spharler, L. E.
Holden, D. W. — Webb, D. L.
Ingeo, G. — Wickman, R. E.
Kevin, P. R.

Member Grade

Ridkel, L. A., Forest Supv., U.S.F.S., Nevada City, Calif. Reinstatement.

Northern Rocky Mountain Section

Student Grade

MONTANA STATE UNIVERSITY

Hanson, H. E.

Ozark Section

Junior Grade

UNIVERSITY OF MISSOURI

Students Eligible for Automatic Advancement

Barnhart, F. T. — Hunt, J. W.
Beilmann, A. F. — Janes, D. J.
Boeckstiegel, L. L. — Smithson, R. M.
Breeding, L. E. — Stinson, D. P.
Burkel, D. L. — Wheeler, J. A.
Click, D. M. — Wood, F. A.

Member Grade

Tufts, D. M., Industrial Forester, 1301 Oak St., Crossett, Ark. (Junior, 1948).

Affiliate Grade

Claxton, H. D., 3119 E. 4th Place, Tulsa, Okla.; Okla. A & M, B.S., (Forestry), 1955.
McCray, W. F., 2963 E. 47th St., Tulsa, Okla.; Okla. A & M, B.S., (Forestry), 1955.
Smith, L. L., 18 S. Russell St., Skiatook, Okla.; Okla. A & M, B.S., (Forestry), 1955.

Puget Sound Section

Junior Grade

Allison, C. R., Asst. Branch Forester, Weyerhaeuser Tbr. Co., Menlo, Wash.; Wash. State, B.S., (Forestry), 1947. (Affiliate, 1953).
Chase, R. A., Forester, U.S.F.S., Port Angeles, Wash.; Yale, M.F., 1954.

Affiliate Grade

Colley, J R., Office Forester, Port Blakely Mill Co., Bremerton, Wash.; Wash. State, B.S., Forestry), 1955.
Hartzell, J. F., Supv. Park Ranger, U.S.D.I., Amanda Park, Wash.
Undi, S. I., Forester, U.S.F.S., Forks, Wash.; Wash. State, B.S., (Forestry), 1948.

Southeastern Section

Junior Grade

Murphy, S. R., President, Murphy Furniture Mfg. Co., Inc., Jasper, Ala. Reinstatement.

ALABAMA POLYTECHNIC INSTITUTE

Students Eligible for Automatic Advancement

Darby, E. W. — Slay, D. T.
Davis, B. A. — Smith, D. E.
Pitts, T. L. — Webb, C. N.

UNIVERSITY OF FLORIDA

Allen, J. R. — Milton, W. W.
Brown, H. D. — Pittman, R. E.
Knapp, B. H. — Riddick, R. L.
Laird, W. H. — Sahlie, W. F.
Menear, W. J.

UNIVERSITY OF GEORGIA

Abel, C. A. — Middleton, B. G.
Blackerby, D. P. — Preston, D. N.
Darden, H. R. — Richards, H. C.
Elliott, M. C. — Rogers, E. B.
Hogan, L. V. — Seery, D. A.
Howard, W. H. — Smith, J. B.
McQuaig, R. L. — Terrill, J. E.

Upper-Mississippi Valley Section

Student Grade

IOWA STATE COLLEGE

Combs, M. H. — Watts, R. H.
Hunter, C. R.

Junior Grade

IOWA STATE COLLEGE

Students Eligible for Automatic Advancement

Chelstad, M. E. — Lutz, C. A.
Collen, D. A. — Marshall, H. J.
Geyer, W. A. — Ploen, D. L.
Herrick, O. W. — Sweitzer, G. A.
Krieger, J. R. — Torrence, J. F.
Jack, L. E. — Wilhite, L. P.

UNIVERSITY OF MINNESOTA

Bendix, V. D. — Long, R. B.
Eck, L. H. — Mielki, T. L.
Lathrop, W. E.

Wisconsin-Michigan Section

Student Grade

UNIVERSITY OF MICHIGAN

Benzie, J. W. — Sucoff, E. I.

Junior Grade

MICHIGAN STATE COLLEGE

Students Eligible for Automatic Advancement

Friend, R. A. — Melcher, W. M.
Gildemeister, G. L. — Minkin, G. W.
Jessup, D. W. — Quick, D. L.
Kind, D. C. — Studebaker, R. L.
Koller, F. J.

UNIVERSITY OF MICHIGAN

Blankenship, C. A. — Myers, E. A.
Bredernitz, D. H. — Ruggeri, F. C.
Carson, H. B. — Santala, A. R.
McElfresh, W. A.

Foreign

Honorary Grade

Oudin, A., Director, National School of Waters & Forests, Nancy, France; l'Ecole Polytechnique, (Forestry), 1908.
Pavari, A., Director, Forest Expt. Sta., Florence, Italy; Univ. of Milan, Dr. of Agric. Science, 1910.
Riquelme Inda, J., Pres., Mexican Forestry Society, Mexico City, Mexico; National School of Agric., of San Jacinto, Mexico, 1905.
Saari, E., Head of Dept. of Forestry, Univ. of Helsinki, Helsinki, Finland; M.F., Univ. of Helsinki, 1916.

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Huntingdon Valley, Pa.

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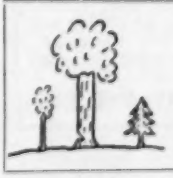

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Forestry News

Paul Zehngraff Cited for Work on Formosa

A release from the FAO (now the International Cooperation Adm.) announces that Paul Zehngraff has received a Citation for Meritorious Service from the Government of the Republic of China in recognition of his technical contributions in the field of forestry for the welfare of Formosa.

Zehngraff went to Formosa in 1951 with the Joint Commission on Rural Reconstruction. This is a joint American-Chinese organization established in 1948 under the China Aid Act.

This is the first time the Government of China has ever given an award to a foreigner and FOA reports that local people themselves petitioned the government to give this special recognition.

Prior to going to Formosa, Zehngraff had been a forestry advisor to the Korean government.

While with the U. S. Forest Service in 1947, he was honored with the Superior Accomplishment Award of the Department of Agriculture.

Twelve Forest Service Employees, Two Units Honored

Recent honors bestowed by the U. S. Department of Agriculture for outstanding service by employees of the department included individual members of the Forest Service and two Forest Service unit organizations.

Individuals and units involved and a brief indication of the nature of the work for which recognition was given follows:

William A. Dayton, plant taxonomist of the Forest Service, Washington, D. C., was honored with the Distinguished Service Award "for important research on grasses, trees, and range vegetation. He started the Forest Service herbarium 44 years ago. It now contains 110,000 plant specimens."

Superior Service Awards were made to:

Charles B. Goetzen, Milwaukee, Wis., "for inspirational leadership of co-workers and cooperators in getting woodland owners to practice good forestry."

Dr. Lee M. Hutchins, Washington, D. C., "for original research on virus diseases of stone fruits, and for inspiring effective leadership of the Department's research on disease of forest and shade trees and forest products."

Charles E. Irwin, Madison, Wis., "for initiative and resourcefulness in maintaining continuity of electrical service which is vitally important to research programs of the Forest Products Laboratory; and for promoting electrical safety consciousness and preventive-maintenance."

Seth Jackson, also of Washington, "for effective leadership in organizing, developing and following through on safety plans and programs which have reduced loss of life, serious injuries, and human suffering."

Durward O. Johnson, Kremlin, Colo., "for his unusual resourcefulness and native ability to cope successfully with complex ranger district problems."

Evelyn E. Kiene, Denver, Colo., "for her unusual competence in interpreting and applying personnel instructions and regulations which has been of invaluable assistance to rangers, supervisors and other key workers."

John J. Morgan, Marienville, Pa., "for his ability to train and inspire construction and maintenance crews to perform all types of assignments in a consistently superior manner without a lost-time accident."

Chester J. Olsen, Ogden, Utah, "for his inspirational leadership in developing, applying and gaining public appreciation of natural resource conservation which is vital to the Nation's welfare."

Helen C. Payne, Ogden, Utah, "for her meritorious leadership in the integration of conservation of natural resources activities through women's organizations and educational programs on local, state and national levels."

Philip C. Wakeley, New Orleans, La., "for meritorious research in forest regeneration and authorship of many scientific publications which have given great impetus to the expansion of reforestation and tree improvement in the South."

Mrs. Louise H. Waters, Washington, D. C., a messenger in the national headquarters since 1919, "for performing her duties in an exemplary manner evidenced by her outstanding dependability, and unfailing courtesy

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and helpfulness which has set an example among her fellow employees."

Work units receiving Superior Service Awards from the Department included:

The **Division of Forest Economics, Southeastern Forest Experiment Station**, Asheville, N. C., "for successfully administering and conducting the Forest Survey which led to high efficiency and low costs, valuable cooperative contributions, skillful factual analysis, and effective dissemination of results."

The **Pine Butterfly Aerial Spraying Project**, Ogden, Utah, "for superior planning, organization and safe execution of the 1954 Pine Butterfly Aerial Spraying Project, Boise National Forest, which established an outstanding example of teamwork."

Seventh International Grassland Congress

The Seventh International Grassland Congress is being held in New Zealand from Tuesday, November 6 to Thursday, November 15, 1956. The aim of the Congress is to bring together as many as possible of the world's leaders in grassland work and to give them an opportunity to exchange information and ideas on grassland production and problems. The Congress is being sponsored by the New Zealand Government under the auspices of the New Zealand Grassland Association, which has set up an organizing committee to make all the arrangements. The Sixth Congress was held in the United States in 1952.

The Congress proper will be held at the Massey Agricultural College, Palmerston North.

The papers at the congress will be at a specialist level and will be presented by persons actively engaged in various aspects of grassland research. The program provides for 13 half-day plenary sessions.

In addition there will be the official opening session and two evening illustrated addresses dealing with "New Zealand Agriculture" and "New Zealand Grasslands."

The official language of the congress will be English.

There will be two categories of participants: *Official delegates* — official representatives of governments; *Members*—scientists and others interested in the establishment, improvement, and utilization of grassland.

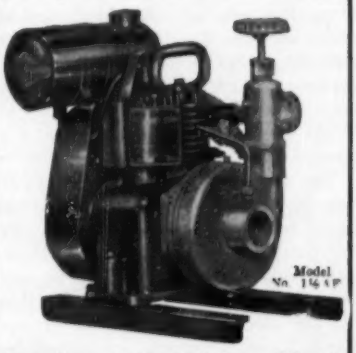
Anyone interested in attending this Congress should notify the Organizing Secretary, CPO Box 1500, Wellington C1, New Zealand, by November 1, 1955, if possible. Such early notification is necessary to assure adequate accommodations for overseas participants.

THE SOUTH gets its first forest fire insurance policy. C. Buck LeCraw (left), Fulton County, Georgia, forest farmer, is presented with the first policy issued by the South Carolina Insurance Company under its new program by Harold G. Hale, company representative. Mr. LeCraw insured 206 acres of loblolly pine and hardwood for $5,275. Witnessing the ceremony is J. Walter Myers, Jr. (right), executive director of the Forest Farmers Association, Atlanta, an organization of forest landowners which has been working for this type of insurance for a number of years.

South's Pulpwood Cut Continues to Increase

In 1954, the South again harvested a record cut of pulpwood and maintained its position as the nation's leading pulpwood-producing region. A report recently released by the Forest Service, U. S. Department of Agricul-

Champion Portable Fire Pumps



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ture, shows that the 12 southern states last year cut a total of 16,269,600 cords of pulpwood, 1 percent more than in 1953. This was 60 percent of the total receipts of domestic pulpwood at all pulpmills in the U. S.

Georgia was the South's leading producer, with 3.1 million cords. Mississippi ranked second with 2.0 million cords. Alabama and Florida were next, with 1.8 and 1.7 million cords respectively. All other southern states except Arkansas, Tennessee, and Oklahoma produced more than a million cords apiece.

At the close of 1954, the South had 67 pulpmills, with a total pulp capacity of 32,000 tons per day.

Copies of the report are available at the Southern Forest Experiment Station, 2026 St. Charles Avenue, New Orleans 13, La.; or the Southeastern Forest Experiment Station, Box 2570, Asheville, N. C.

Forestry Employment

S.A.F. members are privileged to insert one 60-word advertisement in this column without charge. Forest industries desiring to employ foresters may insert advertisements at the rate of $4 per column inch. Copy must be received by the end of this month for an advertisement to appear in the issue after next.

Obviously, the Society cannot assume responsibility beyond making it possible for prospective employee and employer to enter into negotiations.

Positions Available

—ASSISTANT PROFESSOR—

Position open September 1 in a southwest college. Man must be well qualified to handle mensuration, protection, sawmilling and logging, and possibly general forestry. Must be competent to initiate and conduct research work during most of the summer. Good salary to a qualified man, preferably with a Ph. D. degree. In application give details of training, experience, and references. **Box B, Journal of Forestry, Mills Building, Washington 6, D. C.**

Forest Management Assistant to District Forester

If interested, address communication to **Director, Texas Forest Service, College Station, Texas.**

Logging engineer 25, B.S.F., Oregon State, 1953, married, one child. At present in U. S. Army, in communications. Will be available in October. Experience: U.S.F.S. Oregon; paper company California. Can obtain 2nd class Radiotelephone License if necessary. Desires employment in western state. **Box A, Journal of Forestry, Mills Building, Washington 6, D. C.**

Logging, Sawmilling, and Forestry Show Planned for Kentucky

A forestry, logging, and sawmilling demonstration will be held September 29 and 30 on the Clarence McDaniel farm in Laurel County, near London, Kentucky.

The two-day event will be sponsored by the Kentucky Agricultural Extension Service in cooperation with other state, regional, and national organizations and agencies. It is the seventh in a series of demonstrations, similarly sponsored to promote good forestry practices among timber owners and operators, and to encourage the use of modern logging and sawmilling machinery in the harvesting and utilization of forest products. Previous shows have been held in Missouri, Ohio, Indiana, and Illinois.

Cooperating with the Kentucky Agricultural Extension Service in the event will be the following organizations: University of Kentucky forestry department; Division of Forestry, State Department of Conservation; United States Forest Service; Cumberland National Forest; Berea Research Center of the Central States Forest Experiment Station; London-Laurel County Development Association; Kentucky Forest Industry Committee; Kentucky Bankers Association, and the manufacturers, distributors, and dealers of forestry, logging, and sawmilling equipment.

James A. Newman, University of Kentucky field agent in forestry, Barbourville, Ky., is general chairman of the show.

Forester with unusual background and ability in the use of aerial photogrammetric techniques in forest inventory and management desires to do this type of work. Capable of organizing and executing forest inventory of large or small acreages, forest growth studies, mill recovery studies, and experienced in land management. Prefer California or the West. Married, age 36, B. S. F., Univ. of California. **Box C, Journal of Forestry, Mills Building, Washington 6, D. C.**

NOTICE TO INDUSTRY

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Keith Cranston, *Forestry Consultant*
LELAND, MISSISSIPPI

An Average of 485 Forest Fires a Day Reported Last Year

Forest fire fighters were called to an average of 485 fires a day during calendar year 1954, the U. S. Department of Agriculture announced. This represents a total of 176,891 forest fires for the year which injured more than 8.5 million acres of forest resources.

This summary compiled by the Forest Service is based on reports from its field offices, the state forestry departments, the Tennessee Valley Authority, and the Department of the Interior.

Although the number of fires in 1954 increased 12 percent over the 154,160 reported for 1953, forest fire fighting agencies are encouraged by two aspects of the 1954 record. The acreage burned decreased, and the number of fires is still under the average for the past five years—181,740—despite the fact many areas experienced several years of continuous drought.

The total acreage burned in 1954 was 8,832,963 acres as compared to 9,975,750 in 1953. The average area per fire dropped from 27.26 acres in 1953 to 23.28 acres in 1954. These figures reflect improvements in fire fighting organization and control methods throughout the country generally. Millions of acres, however, are still inadequately protected—too few lookouts to spot and report fires immediately, too few suppression crews to hit fires while they are small, or too little equipment to do the job effectively on the fire line.

The overall drop in the number of fires during the past five years is believed to have been brought about by the Smokey Bear forest fire prevention campaign conducted by state and federal forest services under direction of The Advertising Council, by the Keep Green Programs sponsored by forest industries and the states, and by the other organized efforts of state publicity bureaus, women's groups, men's clubs, and young people's organizations.

These campaigns have reached millions of Americans as evidenced by the steady drop in the number of fires caused by campers. On lands under organized protection against fire (figures are not available on causes of fires on unprotected lands) campers started 4,875 fires in 1954 as compared to 5,140 in 1953 and 5,667 in 1952. This reduction was accomplished in spite of the 22 percent increase in the recreation use of the woods since 1952.

The success of the campaigns among

these people points up the need for more concentrated forest fire prevention among those living and working in the woods. Last year, for example, there were 40,520 incendiary fires as compared to 30,186 in 1953. Some 30,318 trash and brush heap fires spread to the woods in 1954; 22,537 in 1953. Smokers caused 23,330 forest fires last year; 20,696 in 1953. These three causes alone account for 74 percent of the forest fires reported.

Other causes of fires and totals were: railroads 2,872 in 1954, 2,619 in 1953; lumbering operations 2,928 in 1954, 2,309 in 1953; man-caused fires with miscellaneous origins 14,650 in 1954, 12,580 in 1953; and lightning 7,780 in 1954, 8,528 in 1953.

Fred E. Dickinson Assumes Directorship

Fred E. Dickinson has become the first director of the new University of California Forest Products Laboratory at Richmond, according to an announcement by Harry R. Wellman, University vice president.

Dickinson went to the post from that of chairman of the Department of Wood Technology of the University of Michigan at Ann Arbor, and head of its forest products laboratory.

As director of the new Laboratory, he will lead a team of investors seeking the widest possible use for California's annual six billion board feet timber output.

Education

Florida Short Course on Kiln-Drying Hardwoods in August

The kiln-drying of southern hardwoods is to be the subject of a short course being offered at the School of Forestry, University of Florida, Gainesville, during the week of August 22-27, 1955. Faster drying, the reduction of seasoning defects, and more precise methods of kiln operations will be stressed.

Instructors for the course will include Edmund F. Rasmussen, Forest Products Laboratory, Madison, Wis.; Walton R. Smith, Michael A. Taras, and Boyd Witherow of the Southeastern Forest Experiment Station, Asheville, N. C.; and J. B. Huffman and Donald K. Post of the School of Forestry. Dry-kiln manufacturers are also being invited to participate in the course.

Persons interested in obtaining more information should contact General Extension Division of Florida, 707 Seagle Building, Gainesville, Florida.

Grading Short Course Held at University of the South

A two-day short course on the grading of hardwood lumber, logs, and trees was attended by 30 lumbermen from forest-related industries in Tennessee and four other southern states at the University of the South, Sewanee, Tenn., May 19-20.

Sponsored by Sewanee's forestry department, which is headed by Charles E. Cheston, and made possible through the cooperation of three other agencies, the lumbermen received instruction in hardwood lumber grading from L. C. Nicely, director of the John W. McClure School of the National Hardwood Lumber Association, Memphis; in log grading from J. A. Putnam, officer-in-charge of the Delta Research Center, Southern Forest Experiment Station, Stoneville, Miss.; and in tree grading from Thomas G. Zarger, staff forester with the Division of Forestry Relations, Tennessee Valley Authority, Norris, Tenn. Classroom instruction was augmented by demonstrations at the University Sawmill and on parts of Sewanee's 7,000-acre forest property.

Two Sawmill Training Conferences Planned for New York

Two small sawmill training conferences will be offered by the State University of New York College of Forestry in August, according to an announcement by Prof. Kenneth C. Compton of the Department of Utilization.

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closer to sawmill workers, the short courses will be offered at the Richland Lumber Co. in Pulaski, N. Y., August 25 and 26; and at the Northern Pine Lumber Co. in Ft. Edward, N. Y., August 29 and 30.

All theory presented in the lectures and discussion will be tested in actual sawmill operation. Among the course subjects will be included equipment used in small sawmills; efficient layout of log yard; financing and managing a small sawmill operation; marketing the products of small mills; power requirements at the sawmill; sawing for production and grade; controlling dimensions of lumber and reducing waste; mill maintenance; fitting and operation of saws; sawing frozen, oversized, and springy logs; and improving lumber handling and seasoning.

Further details and registration forms may be obtained from Short Course Service, State University of New York, College of Forestry, Syracuse 10, N. Y.

Public

C. J. Telford Retires as Sawmill Specialist

C. J. Telford, widely recognized authority on the operation of small sawmills retired June 30 after 26 years of continuous service at the U. S. Forest Products Laboratory, Madison, Wis. His research findings on ways to improve the efficiency of small sawmill have been published in more than 3 bulletins and other publications of the Forest Service. Some of these, such as "Small Sawmill Operator's Manual," and "Small Sawmills: a Pocket Guide," are considered "bibles" of the industry.

Highlights of Telford's professional career also include direction of sawmill activities for the Forest Service following the New England hurricane disaster, and work with field men of the Timber War Production Project throughout the East, Midwest, and South during World War II.

Prior to joining the staff of the Laboratory in 1929, Telford had engaged in various aspects of forestry work for 16 years, including several years as extension forester for the State of Illinois. He received a master's degree from the Yale University School of Forestry in 1915.

Perry H. Merrill Receives Honorary Degree

Perry H. Merrill, state forester of Vermont, was honored by Middlebury College, Middlebury, Vt., by having an honorary Doctor of Science degree bestowed upon him at the college's June commencement exercises.

Mr. Merrill was at one time a faculty member of the college. He has been state forester of Vermont since 1930 and an active member of the Association of State Foresters.

Paul Flink, R. C. Fox to New Positions

Paul Flink, Iron Mountain, Mich., has joined the Michigan Conservation Department's forestry division staff as state forest entomologist.

He replaces Richard C. Fox, department entomologist for the last 3½ years, who resigned to teach and work toward a doctorate degree at Michigan State College.

Flink had been employed by the Kimberly-Clark Corporation of Michigan.

E. J. Woolfolk Transfers to California Station

E. J. Woolfolk has recently assumed the duties of chief of range management research at the California Forest and Range Experiment Station according to George M. Jemison, director of the station.

Woolfolk went to the California station from the Southeastern Forest Experiment Station in Asheville, N. C., where he had been in charge of range research since February 1954.

Before 1954 he conducted range studies in the Rocky Mountain and Great Plains regions and served in Washington, D. C. where he assisted in development and administration of the overall Forest Service range research program.

In 1953 he was selected for a short-

term assignment with the Inter-American Institute of Agricultural Sciences in Buenos Aires, Argentina.

Woolfolk graduated from the University of Montana in 1933. He is the author of more than 50 publications on range subjects, including a Department of Agriculture Circular on management of sheep ranges in the northern Great Plains.

Allied

William Voigt Resigns as Director Izaak Walton League

The Izaak Walton League of America has announced the resignation, at his request for reasons of family health, of William Voigt, Jr., as executive director of the nationwide natural resource conservation organization, headquartered in Chicago.

Voigt, a native of Georgia and a former writer and public relations man, had been on the League staff since July, 1945. He became executive director upon the retirement of his predecessor, Kenneth A. Reid, in 1948.

A successor to Voigt has not been chosen.

Albert M. Day Accepts New Post

Albert M. Day has resigned from the position of assistant to the director of the U. S. Fish and Wildlife Service to direct a study of factors affecting the welfare of North American waterfowl. The investigation is to be sponsored by the Artic Institute of North America; its purpose is to study programs and policies of all land and water-use agencies affecting the perpetuation of waterfowl on the continent.

Mr. Day was director of the Fish and Wildlife Service from 1946 to 1953. He began his professional career as a field biologist for the Biological Survey in 1918 and is widely known for his work in wildlife conservation, including authorship of *North American Waterfowl.*

Industry & Private

Bruce Stewart Joins Southland Paper Mills, Inc.

Bruce Stewart, executive secretary of the Texas Forestry Association for the past three years, has resigned to join the wood procurement department of Southland Paper Mills, Inc., Lufkin.

Mr. Stewart was graduated from the University of Georgia School of Forestry in 1939.

Weyerhaeuser to Construct $20 Million Sulphite Mill

Weyerhaeuser Timber Company has announced plans for constructing a 400-ton sulphite mill at Cosmopolis, Wash., on an 850-acre site purchased from the Ultican interests.

Work on the new mill will start late this year and is expected to be completed during 1957 at a cost in excess of $20,000,000. The new plant will be known as the Grays Harbor mill of Weyerhaeuser Timber Company's pulp division. According to company president J. P. Weyerhaeuser, plans, which are still in the formative stage, call for construction of a sulphite pulp mill which will employ approximately 300 men and women with an annual payroll of about $1,500,000.

Paul N. Goodmonson Becomes Consulting Forester

Paul N. Goodmonson, forest products marketing specialist with the Ex-

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tension Service at Corvallis, Ore., for the past five years has resigned to enter the consulting forestry field.

Mr. Goodmonson plans to specialize in management of second-growth Douglas-fir, following through with whatever actual operations such as thinning or planting may be recommended for the property.

Goodmonson will continue to live in Corvallis, near which he has a tree farm ownership.

Prior to joining the Extension Service he was a tree farm forester with Crown Zellerbach Corporation.

R. Davis and D. W. Smith Assume New Duties

Ralph Davis has recently resigned as area forester with the Southern Pulpwood Conservation Association, Huntsville, Texas, which position he has held since 1950. Mr. Davis has assumed new duties in charge of the conservation division of the Champion Paper and Fibre Company located at Huntsville, Texas.

Donald W. Smith has replaced Mr. Davis as forester with S.P.C.A., coming to the position from that of district forester with the Texas Forest Service for the past several years at Linden.

Community Seeking Pulp Mill Engages Consulting Forester

The Tupper Lake (N. Y.) Chamber of Commerce has announced the engagement of John Stock, forest consultant of Conifer, N. Y., for a prolonged period to assist them in gathering and correlating data which will be used by the Chamber in attempting to interest industry in the establishment of a hardwood pulp mill in the area.

Tupper Lake is located in the heart of the Adirondack Mountains and is surrounded by 600,000 acres of privately owned forest land. It has always been dependent on a forest economy, until now one based upon its sawmills. Noting the dense growth of young hardwoods, reported to be in excess of 125,000 cords annually, the Industrial Committee of the Chamber sought the service of a consultant. Mr. Stock is undertaking the assignment and indicates that adequate wood supply and lack of competition make the village an ideal location for the establishment of a mill.

Stock is Logging Safety editor of *The Northeastern Logger*, and a member of the board of the Northeastern Logger's Association.

Knox Marshall New Western Pine California Forester

Knox Marshall has been appointed California forest engineer for the Western Pine Association.

He replaces Ralph Hodges, who has taken a position with Wetsel-Oviatt Lumber Co. near Sacramento.

Marshall's appointment was announced by association Chief Forester E. L. Kolbe.

Since 1952 Marshall has been in charge of timber management for the Kaniksu National Forest, headquartering at Sandpoint, Idaho. Prior to that he had been assistant to the head of the division of recreation and lands and fire control in the regional office at Juneau, Alaska.

A graduate of the University of Washington, 1937, he moved to Alaska first as CCC foreman, then assistant ranger, ranger, timber cruiser, and division supervisor.

The new forester's duties, Kolbe said, will include advising association member companies on forestry programs and problems, working in conjunction with the California forest practices committee.

Marshall will also advise Western Pine tree farmers, inspect new, and reinspect operating tree farms.

Tree Farm Area Reaches 35,396,564 Acres

The American Tree Farm System has reached 35,396,564 acres according to James C. McClellan, chief forester for American Forest Products Industries, national sponsor of the program. Mid-year Tree Farm figures show a gain of nearly 2 million acres in the program since Jan. 1.

The ratio of certified Tree Farms to all privately owned timberland runs 34.1 percent in Texas and 33 percent in both Washington and Oregon. It is 22.8 percent in California, 20 percent in Arkansas, 19.8 percent in Montana, 17 percent in Nevada, 16.1 percent in Florida and 15.4 percent in Alabama.

Texas continues to lead the nation in tree farming with 3,438,970 acres. Arkansas has climbed into second place with 3,300,000 acres. Oregon, with 3,259,079 acres, recently pulled ahead of Washington which has 3,231,608 acres. Florida retains its strong position with 3,177,321 acres. Another state which has topped the 3,000,000-acre mark is Alabama with 3,043,639 acres.

Of the 359,533,267 acres of privately owned commercial forest land in the United States, McClellan reports, 9.8 percent is now in certified Tree Farms.

Partial view of the J. & F. Brisson Wood Treating Yard in Chatham, Michigan

Successful Lumber Dealer Points Up Big Future in Wood Treating

We've all heard a lot about the pros and cons of wood treating as a business but to give you a chance to make up your own mind on the subject, we present the personal experience of Mr. Joseph Brisson, of J. & F. Brisson, Lumber Dealers of Chatham, Michigan, who says:

"About a year ago I called on one of the local underground iron mines to sell hardwood ties and learned from their office that they were using Osmose treated hardwood ties and timbers. I then contacted the Osmose Branch Plant at Bessemer, Michigan, and learned that it would be possible for me to set up an Osmose plant on a licensed treating franchise.

"Soon after I visited the Bessemer plant and also the licensed plant at Bemidji, Minn. I was greatly impressed with the relatively small investment needed to set up an Osmose treating plant as compared with the amount required for a pressure treating plant. I immediately signed a contract with the Osmose Wood Preserving Co. as a licensed dealer and started building my plant which was completed in May, 1954.

In a very few months we have found a growing demand for Osmose treated products of all types including mine ties, plank, posts and poles, dray runners, railroad switch ties, spruce ladders, etc. We are now treating hardwood and softwood planking to replace Cedar lagging which has proven (in one of the mines in this area) that treated planking is out-lasting the Cedar lagging. Also, farmers have purchased our Osmose treated materials and I am firmly convinced that Osmose treating is something that all farmers should take advantage of in treating fence posts and all lumber and timber that is exposed to weather.

"I have been greatly encouraged by the inquiries and the interest that the mines and other industries have shown. We have noticed an increase in repeat business which shows beyond any doubt that the purchaser is sold on Osmose treatment and prospects for the future indicate an even greater increase in this repeat business along with new business."

If you are interested in receiving details on how *you* can get into this profitable business, write to Joseph M. Bray, Vice-President, Osmose Wood Preserving Co. of America, Inc., 980 Ellicott St., Buffalo, N. Y.

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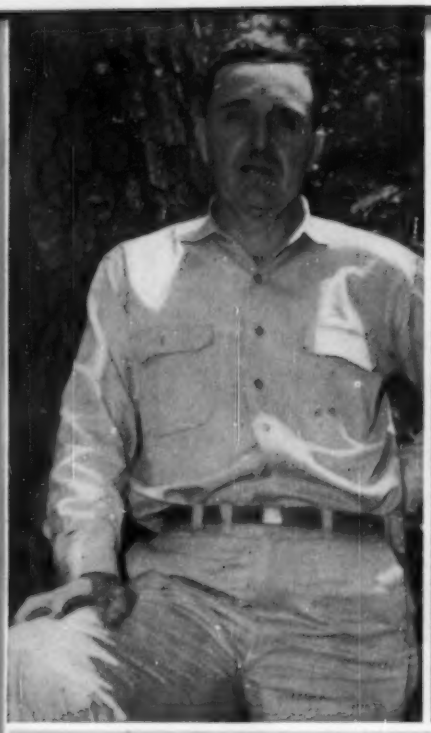

How T. M. Lacy keeps road-building cost down

He uses a CAT* D6 Tractor with No. 6A Bulldozer. Average production: ½ mile or more road per 10-hour day in going like this

You're looking at typical terrain on an 8000-acre tract near Charleston, S. C., where T. M. Lacy is contract logging under government controls. He takes out 40,000 bd. ft. a day, about two-thirds saw timber and the rest pulpwood. Here he's using this D6 with No. 6A Bulldozer to build a road for tractors and trucks. The rig averages ½ mile or more road a 10-hour day. It works 5 days a week, all year round.

"I bought this D6 because of the oil-type clutch," Mr. Lacy says. "I studied the specifications and decided that this is the type of clutch we need. I have two other D6s—you can't beat a D6 for logging. It's very well balanced and fast."

Bigger Production with Oil Clutch

Reports from job after job show that Caterpillar's exclusive oil clutch reduces costs and steps up production. It saves you money, trouble and time two ways: (1) Clutch adjustment, while easily done, is seldom required. (2) Plate replacement is normally necessary no more often than engine overhaul. Another plus: the clutch provides easier shifting for the operator, an important factor in stepping up production particularly on bulldozing jobs. In fact, the tougher the job, the better the oil clutch shows to your advantage.

The oil clutch is standard on all D6s. It is just one of many features that make the D6 a standout on *any* woods job. Your Caterpillar Dealer, nearby for service and information, will be glad to demonstrate.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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USE CAT EQUIPMENT FOR MONEY-SAVING PERFORMANCE